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To: Product Manager
TS-767

Through: Dr. Gunter Zweig, Chief
Environmental Fate Branch

From: Review Section No. 1
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 707-RU0, RLN PP9F2158

Chemical Sodium 5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoate,
Blazer, RH-6201, acifluorfen sodium salt

Type Product: herbicide

Product Name: Blazer 2S and Blazer 2L

Company Name: Rohm and Haas

Submission Purpose: new chemical, registration on soybeans

ZBB Code:

Date in: January 8, 1979

Date Completed: 12/28/79

Deferrals To:

☒ Ecological Effects Branch

☐ Residue Chemistry Branch

☒ Toxicology Branch

1. INTRODUCTION

1.1 This is the first submission for registration of the herbicide Blazer. The proposed use ~~is~~ on soybeans and two formulations, each containing 2 lb ai per gallon, are involved; a 2S ~~and a 2L~~

1.2 The chemical name of Blazer is: Sodium 5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoate. It is also known as the sodium salt of acifluorfen, RH-36201 and RH-6201.

1.3 Physical and chemical properties

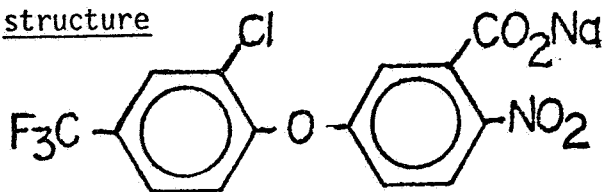
molecular weight - 383.65
melting point - about - 10°C (45% ai)
boiling point - 100°C
vapor pressure - 24 mm at 25°C (technical product)

RH-6201 has negligibly small vapor pressure.

<u>solubility</u> --	acetone	>50%
	benzene	1%
	chloroform	<1%
	carbon tetrachloride	>50%
	DMF	>50%
	DMSO	>50%
	ethanol	>50%
	ethyl acetate	>50%
	hexane	< 1%
	methanol	>50%
	methylene chloride	< 1%
	xylene	< 1%
	water	miscible

physical state of the technical - brown, aqueous, viscous solution with a faint odor, pH=8.5 ± 0.5.

structure



Inert ingredient information is not included

2. DIRECTIONS FOR USE

2.1 Apply Blazer at 0.25-0.50 lb ai/A post-emergent to young, growing weeds in soybean fields via ground equipment. Cover all weed parts thoroughly.

2.2 Do not apply to weeds above the maximum height listed on the label or when crops and weeds are under stress. Rainfall occurring a few hours after application will affect control.

2.3 Do not mix with fertilizers or pesticides. Do not apply within 50 days of harvest and do not apply more than 0.50 lb ai/A per season. Do not use treated plants for feed or forage. Avoid drift situations where applied material may drift to non-target areas.

2.4 Do not reuse empty container. Destroy by perforating or crushing. Bury waste and container in a landfill away from water supplies.

3. DISCUSSION OF DATA

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3.1

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Augenstein, L.L. (1975). A Hydrolysis Study with ¹⁴C-RH-6201 (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 3423-75-66), Acc. No. 095735, Tab. 17, p. 1297

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: David Arieti, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 9, 1979

TEST TYPE: Hydrolysis

CONCLUSION:

Hydrolysis does not occur under the experimental conditions of this study.

MATERIALS AND METHODS:

Aqueous solutions of carboxyl-labeled RH-6201 at 1 and 50 ppm, and buffered at pH 4.5, 7.2, and 9.7, were incubated for 56 days at three temperatures. Aliquots were removed for radioassay and examined by TLC. TLC plates were visualized under UV lamps and radioautography was performed by using Kodak X-ray film.

RESULTS:

1. The only radioactive component present was RH-5781 (the free acid form of RH-6201).
2. The low recoveries on day 0 were explained by the registrant as due to a measurement error.

3. Actual Concentration of ¹⁴C-RH-6201 in Hydrolysis Solutions

Day of Sample	Nominal Concentration	Temperature: pH:	PPM calc as ¹⁴ C-RH-6201											
			25°				36°				48°			
			4.5	7.2	9.7	4.5	7.2	9.7	4.5	7.2	9.7	4.5	7.2	9.7
0	50		46.82	48.87	49.12	46.43	48.72	49.19	47.09	48.30	49.00			
7	50		50.77	49.61	49.19	49.84	50.95	49.07	51.11	48.79	49.49			
14	50		57.61	55.87	53.03	53.07	55.96	57.36	56.23	56.22	58.46			
28	50		50.90	50.63	49.18	51.75	52.10	53.02	53.71	52.92	54.27			
56	50		53.45	53.14	51.43	54.99	55.16	54.81	59.96	55.80	59.89			
0	1		1.04	1.06	1.06	0.95	0.97	1.02	1.01	1.00	0.99			
7	1		1.11	1.14	1.12	1.03	1.04	1.11	1.10	1.09	1.10			
14	1		1.26	1.26	1.27	1.16	1.21	1.18	1.01	1.27	1.26			
28	1		1.09	1.12	1.12	1.10	1.18	1.14	1.22	1.17	1.68			

4. Percent of ^{14}C Extracted into Benzene from Hydrolysis Solutions

Day of Sample	Nominal Concentration	Temperature: pH:	% of Total ^{14}C Found in Benzene					
			25°		36°		48°	
			4.5	7.2	9.7	4.5	7.2	9.7
0	50 ppm		16.6	96.4	97.1	34.3	97.0	97.0
7	50		97.9	96.9	98.1	98.1	67.4	70.2
14	50		98.0	97.1	98.7	55.1*	56.1*	54.6*
28	50		97.7	97.6	98.0	97.7	97.7	98.0
56	50		97.7	98.1	98.2	97.7	98.1	98.4
0	1 ppm		93.1	10.7	96.4	93.4	6.8	97.4
7	1		97.8	98.0	98.0	97.4	97.8	69.8
14	1		98.4*	84.5*	89.4*	97.8	73.1*	98.3
28	1		96.8	97.8	97.9	97.8	98.3	97.9
						97.5	97.1	97.8

*These values are based on the results obtained from the second counting of the extracted aqueous solutions.

3.2

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Augenstein, L.L. (1976). A Study of the Photolysis of ¹⁴C-RH-6201 in Water (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-76-14), Acc. No. 095735, Tab 18, p. 1399

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: M. Edwards, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 4, 1979

TEST TYPE: Photolysis Study in Water

CONCLUSIONS:

1. The data indicate that photodegradation of RH-6201 occurs under sunlamp conditions in the presence of acetone-sensitizer (half-life approximately 60 hours), and under blacklight conditions in both the presence and absence of sensitizer (average half-life approximately 139 hours). Photolysis reactions follow first order kinetics. The discrepancy between these findings, and the lack of degradation under sunlamp conditions in the absence of sensitizer could be due to the different energy distributions of the sunlamp and blacklight.
2. A product identified as 2-chloro-1-(4-nitrophenoxy)-4-trifluoromethylbenzene (RH-2512) and seven unidentified photoproducts presumed to be derivatives of RH-2512 result from photodegradation of trifluoromethyl-labeled RH-6201. None of these products exceeds 7% of the original radioactivity. Photolysis of carboxyl-labeled RH-6201 yields RH-5781, the free acid form of RH-6201, as the only radioactive photoproduct.
3. A major weakness of the study design is the lack of dark controls. Thus, the contribution of non-photodegradative processes (such as hydrolysis) to the breakdown of RH-6201 cannot be determined. However, hydrolysis data reviewed in section 3.1 above shows the free acid (RH-5781) of Blazer to form in water which, in turn, is stable to hydrolysis.

MATERIALS AND METHODS:

Two preparations of RH-6201 were used in these experiments, one labeled at the trifluoromethyl carbon and the other labeled at the carboxyl carbon with carbon-14.

The photolysis unit consisted of a pyrex glass cell, and allowed for the removal of test solution during the experiments and collection of volatile products and evolved CO_2 . These products were carried to collection traps by a continuous flow of CO_2 scrubbed air through the system. The light sources used were a 20-watt fluorescent sunlamp and fluorescent blacklight. The UV cutoff of the photolysis cell was approximately 290 nm, and it was noted that the most intense radiation from the blacklight (320-380 nm) was at longer wavelengths than the sunlamp (300-350 nm).

Five ppm aqueous solutions of the RH-6201 preparations (pH adjusted to approximately 8) were used, with and without a 2% acetone sensitizer. Aliquots of the test solution were removed before photolysis was begun, and at regular intervals thereafter (usually 24 hours). The traps for capturing carbon-14 volatiles and CO_2 were changed periodically during photolysis. Photolysis solutions and traps were analyzed by radio TLC, followed by scraping and standard liquid scintillation counting techniques.

RESULTS:

1. Degradation of Carboxyl-Labeled RH-6201

Sunlamp photolysis of the carboxyl-labeled RH-6201 preparation in the absence of sensitizer failed to degrade the compound after 48 hours of exposure (Result 5). Degradation was observed in the presence of 2% acetone sensitizer, with the major photodegradative pathway identified as decarboxylation (evidenced by the generation of large amounts of labeled CO_2). A second pathway, hypothesized to produce polar compounds, was evidenced by decreasing extractibility of the photolysis solution with benzene.

Blacklight photolysis of the carboxyl-labeled preparation in the absence of sensitizer produced greater degradation than under the sunlamp in the absence of sensitizer, with 20 and 55% of the original radioactivity being evolved as labeled CO_2 after 48 and 264 hours, respectively. Blacklight photolysis in both the presence and absence of sensitizer again indicated decarboxylation as the major photodegradative pathway. In the presence of acetone sensitizer under blacklight conditions, polar water soluble photoproducts were not found, but such products were observed in the absence of sensitizer. None of the photolysis experiments with carboxyl-

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labeled RH-6201 showed greater than 0.01% of the original carbon-14 as organic volatiles.

2. Photolysis of Trifluoromethyl-Group-Labeled RH-6201

Blacklight photolysis studies with trifluoromethyl-group-labeled RH-6201 in the presence of sensitizer showed labeled CO₂ evolution representing less than 10% of the original activity. The formation of polar, water soluble photoproducts was evidenced by the decreasing extractability of aqueous photolysis subsamples. Blacklight irradiation of trifluoromethyl group-labeled RH-6201 showed approximately 8% of the total radioactivity as RH-2512.

3. Identification of Photoproducts

TLC and radioautography of photolysis subsamples of the carboxyl-labeled RH-6201 preparation demonstrated that RH-5781, the free acid form of RH-6201, was the only radioactive photoproduct. TLC and radioautography of benzene extracts of the final photolysis solution of trifluoromethyl-labeled RH-6201 showed the presence of as many as eight photoproducts, only one of which was identified. This photoproduct was identified as 2-chloro-1-(4-nitrophenoxy)-4-trifluoromethylbenzene (RH-2512), and represented approximately 2% of the radioactivity in the benzene extract of the final photolysis solution. The remaining unidentified photoproducts were presumed to be derivatives of RH-2512, and all but one of these unidentified products represented approximately 2% or less of the total radioactivity applied to the TLC plate (one unidentified photoproduct accounted for approximately 7% of the radioactivity).

4. Half-Life Calculations

Results 5 present the half-life estimates for the various photolysis experiments. The average half-life of labeled RH-6201 under blacklight photolysis was approximately 139 hours. The sensitizer was not observed to affect the degradation under blacklight conditions, but it greatly increased photodegradation under sunlamp illumination. Photolysis reactions were considered to follow first-order kinetics.

5.

Summary of Photolysis Experiment Results

<u>Light Source</u>	<u>Sensitizer</u>	<u>Site of ^{14}C Label</u>	<u>Material Balance (%)</u>	<u>% ^{14}C Evolved as $^{14}\text{CO}_2$</u>	<u>% of Parent in Final Solution</u>	<u>RH-6201 Half-Life (Hr)</u>
Sunlamp	None	COO^-	101.5	0.1	94.3	----
Sunlamp	2% Acetone	COO^-	88.9	66.4	69.4	59.7
Blacklight	None	COO^-	96.2	55.4	69.3	125.7
Blacklight	2% Acetone	COO^-	76.1	39.4	89.2	141.9
Blacklight	2% Acetone	CF_3	72.4	10.6	55.8	130.8
Blacklight	2% Acetone	CF_3	71.0	9.7	64.4	158.0

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3.3

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Peirson, W.M., and J.D. Fisher (1978). Long-Term Laboratory Photolysis Study of RH-6201 on Soil (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-78-8), Acc. No. 097720, Tab 8, p. 58

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: M. Edwards, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 5, 1979

TEST TYPE: Long-Term Laboratory Photolysis Study on Soil

CONCLUSIONS:

1. RH-6201 photochemically degrades on soil under sunlight, with cleavage of the diphenyl ether bond being the principal route of decomposition, and with a half-life of approximately 57 days under laboratory conditions.
2. Disappearance of the parent compounds (the free acid form of RH-6201) in the soil extracts over time results in increases in polar materials and unknowns. Non-volatile photoproducts are not expected to exceed 10% of the initial application. A volatile photoproduct representing < 10% of the initial material was found and identified as RH-34800. Its presence indicates cleavage at the diphenyl ether bond. Minor amounts of RH-4515 and RH-5782 were also found.

MATERIALS AND METHODS:

Two preparations of the experimental herbicide RH-6201 and a reference compound, 2,4-D (2,4-dichlorophenoxyacetic acid), were used. One preparation of RH-6201 was labeled with carbon-14 in the trifluoromethyl group and the other was labeled uniformly in the nitrophenyl ring. The reference compound was uniformly ring-labeled.

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Fifteen-gram samples of Lawrenceville silt loam soil (pH = 6.9; CEC = 15.0; organic matter = 3.6%; sand = 44%; silt = 46%; clay = 10%) were moistened to the point of clumping and placed in each of 15 borosilicate glass tissue culture flasks. Aqueous solutions of the test compounds were added to the soil surface to provide a level of 5 ppm.

Organic volatiles evolved during photolysis were trapped on segments of Chromosorb^R 101 beads; CO₂ was trapped by a 2-methoxyethanol/ethanolamine solution. The flasks were connected to a source of humidified, CO₂-free air, and the atmosphere of the flasks was purged (through the Chromosorb and carbon dioxide traps) for a total of four minutes each hour. Photolysis units consisted of three 40-watt fluorescent sunlamps alternating with three 40-watt fluorescent blacklights. The lower surface of the lamps was 4 cm above the flasks, with the average intensity measured at 4.3 watts/m². Emitted light was between 280 and 500 nm. Chromosorb and CO₂ traps were radioassayed using liquid scintillation. Soil from all the terminated flasks was extracted, and the extracts and soil radioassayed by standard liquid scintillation counting techniques (LSC).

Degradation products of RH-6201 were determined by TLC cochromatography. Quantification of degradation products was accomplished by autoradiographic location, extraction, and LSC.

An additional experiment was conducted to characterize a volatile photoproduct which appeared in the chromosorb volatile traps following irradiation of trifluoromethyl-labeled RH-6201. This was accomplished using a larger sample (50 ppm) of the trifluoromethyl-labeled RH-6201, and replacing the chromosorb trap with XAD-4 resin. Organic volatiles were then examined by gas-liquid chromatography and mass spectrometry.

RESULTS:

1. Thin Layer Chromatography (TLC)

Decline of RH-6201 in soil extracts corresponded to increases in polar material. Identification of individual soil extract photoproducts beyond cochromatography was not considered possible, because of the small amounts formed (less than 10% of application). Minor amounts of RH-4515 and RH-5782 were found.

2. Identification of Volatile Product of RH-6201

Results of the study undertaken to characterize the volatile photoproduct following irradiation of soil at 50 ppm trifluoromethyl-labeled RH-6201 showed via GLC-MS that the volatile product was RH-34800.

3. Recovery of Radioactivity (Material Balance)

	<u>% of Spike</u>					
	<u>Organic Volatiles</u>	<u>CO₂</u>	<u>Soil Extract</u>	<u>Extracted Soil</u>	<u>Total</u>	<u>Adjusted % RH-6201*</u>
<u>CF₃</u>						
0 day	- - - -	- - - -	95.13	2.16	97.29	100.0
3 day	0.02	0.09	92.96	3.82	96.89	98.2
10 day	3.16	0.27	83.18	6.08	92.69	87.7
20 day	6.71	0.46	81.23	10.47	98.87	81.4
30 day	3.98	1.37	82.73	11.60	99.68	83.8
Dark	1.79	1.07	88.85	7.45	99.16	
<u>NPR</u>						
0 day	- - - -	- - - -	100.87	2.15	103.02	100.0
3 day	0.02	0.26	87.23	12.93	100.44	97.7
10 day	0.01	0.04	85.35	9.58	94.98	89.6
20 day	0.00	0.38	83.52	10.40	94.30	76.8
30 day	0.03	0.89	84.36	15.51	100.79	78.6
Dark	0.00	2.32	90.03	9.95	102.30	

*% RH-6201 in soil, adjusted to 100% recovery

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3.4

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Fisher, J. D. and W. M. Pierson. (1976). RH-6201 Laboratory Soil Metabolism Study (unpublished report for Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-76-10), Acc. No. 095733, Tab 11, p. 657

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: David F. Arieti, Staff Scientist, Enviro Control, Inc., Rockville, MD

DATE OF REVIEW: October 10, 1979

TEST TYPE: Soil Metabolism

CONCLUSIONS:

1. RH-6201 applied as a sodium salt to soil converts to the acid form roughly within 1 day.
2. Under aerobic conditions in sandy loam soil, the acid form of the parent compound degrades at a half-life of 1 to 2 months. At 1 month, 20% of applied activity from carboxyl-labeled RH-6201 will be released as CO₂ with an additional 10% being released over the next month, and an additional 3% being released over the next 4 months. Metabolites RH-4515, 4514 and 5782 will be found in the soil but will not exceed 7% of the initial RH-6201. Microbial metabolism appears to be the major breakdown mechanism. Comparisons with non-sterile controls showed that RH-6201 does not affect soil respiration (assayed by total CO₂ production) at 1 or 10 ppm RH-6201.
3. RH-6201 half-life under aerobic conditions in silt loam soil is 2 to 6 months. CO₂ is released at a slower rate in silt loam than in sandy loam, but after 6 months of incubation total CO₂ released will be the same for the two soils. Identical metabolites in similar quantities are found in the two soils except for the formation of one additional unidentified minor (less than 3.5%) metabolite in the silt loam soil.

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4. Half-life of the acid form of RH-6201 under anaerobic conditions was reached in less than 10 days in both soils treated. Metabolite RH-4514 reaches a maximum of 36 - 46% 2 months after anaerobic incubation and degrades very slowly over the subsequent 4 months, indicating some stability of RH-4514 under anaerobic conditions. RH-4515 also forms but never exceeds 7.5% of the initial RH-6201. Four unidentified compounds form but each does not exceed 11% of the initial RH-6201. Unidentified polar material represents 30 - 47% of the initial during 6 months of anaerobic incubation.
5. The 10 ppm fortified soil evolved proportionately less CO₂ than the 1 ppm fortified soil (in a rough ratio of 3 to 1). This can be explained by either inhibition of the microbe(s) responsible for RH-6201 degradation at the 10 ppm level or the level may be an amount too great to be utilized by the microbe(s).

MATERIALS AND METHODS:

Sandy loam and silt loam soils (described below), and sterilized soil were treated at 1 and 10 ppm with carbon-14 labeled RH-6201 (either at the trifluoromethyl or carboxyl group).

<u>Mechanical Analysis</u>	<u>Pasoquotank Sandy Loam</u>	<u>Lawrenceville Silt Loam</u>
Sand	71 %	44 %
Silt	22 %	46 %
Clay	7 %	10 %
Organic Matter	2.6 %	3.6%
Cation Exchange Capacity (meq/100 g)	7.0	15.0
pH	5.5	6.9
Field Moisture Capacity @ 1/3 Bar	12.5 %	27.4%

Ring-labeled 2,4-D was used as a reference compound. Aerobic flasks were connected in series with an oxygen line. Anaerobicity was established by flooding with water and maintained by introducing a nitrogen atmosphere and was run on the sandy loam soil. Total CO₂ was measured by titration of the sodium hydroxide trapping solution while trapped. Labeled CO₂ was measured by counting aliquots in a liquid scintillation counter (LSC).

Aerobic, anaerobic and sterilized soil samples were taken and analyzed for carbon-14 using standard LSC techniques. The 1 ppm fortified soils were sampled up to 60 days and the 10 ppm fortified soils were sampled from 60 to 182 days.

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Characterization of breakdown products was made by acidifying with HCl followed by soxhlet extraction with methanol and by using thin-layer chromatography.

Residues of the aerobic soils were characterized by subsequent extraction with benzene, NH_4OH and NaOH. The supernatant from the NaOH extractions was acidified to precipitate and thereby separate the humic acid from the fulvic acid. The humic and fulvic acid fractions were also partitioned with EtOAc which was analyzed by TLC. Residues in the anaerobic soils were characterized similarly except for an initial hexane extraction to remove methane and extracting with HCl instead of NH_4OH . The organic and NH_4OH extracts were additionally analyzed by TLC.

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RESULTS:

1.

Summary of Total Carbon Dioxide Titration Data
Non-Sterilized Soils

Sample	Elapsed Days	Carbon Dioxide Trapped ($\mu\text{g/g}$ soil/day)						Total
		10	15	30	60	107	180	
<u>Sandy Loam Soil</u>								
Control		108	164	37	24	17	13	363
1 ppm COO^- - ^{14}C -RH-6201		108	158	34	24	17	12	353
10 ppm "		108	174	36	21	15	11	365
1 ppm CF_3 - ^{14}C -RH-6201		108	118	36	25	18	13	318
10 ppm "		108	226	35	24	17	13	423
1 ppm ^{14}C -2,4-D		108	162	37	26	19	13	365
10 ppm "		108	188	36	24	18	12	386
<u>Silt Loam Soil</u>								
Control		108	32	17	13	10	8	188
1 ppm COO^- - ^{14}C -RH-6201		107	118	36	16	11	8	296
10 ppm "		108	58	19	12	9	7	213
1 ppm CF_3 - ^{14}C -RH-6201		108	60	20	13	9	8	218
10 ppm "		108	62	19	11	8	7	215
1 ppm ^{14}C -2,4-D		101	102	27	17	10	8	265
10 ppm "		97	102	44	17	10	7	277

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2.

Carbon Dioxide Titration Data
Sterilized Sandy Loam Soil

<u>Sample</u>	<u>Elapsed Days</u>	<u>CO₂ Trapped</u> <u>(μg/g² Soil/Day)</u>				<u>Total</u>
		<u>10</u>	<u>15</u>	<u>30</u>	<u>60</u>	
Control	2	0	0	1		3
1 ppm COO ⁻ - ¹⁴ C-RH-6201	3	0	0	1		4
10 ppm "	3	0	0	1		4
1 ppm CF ₃ - ¹⁴ C-RH-6201	4	3	5	2		14
10 ppm "	4	0	2	1		7
1 ppm ¹⁴ C-2,4-D	4	5	5	2		16
10 ppm "	4	2	2	1		9

3. Total ^{14}C (Combustion) of Soil Samples-Aerobic

Sample	Elapsed Days	Residue as PPM Parent Compound						Sterilized Soils
		0	10	30	60	107	182	
<u>COO⁻ - ¹⁴C-RH-6201</u>								
1 ppm Sandy Loam		1.21	1.12	0.88	0.74	0.58	0.62	1.20
10 ppm "		11.13	11.80	11.86	11.91	9.90	10.61	12.22
1 ppm Silt Loam		1.22	1.13	0.95	0.87	0.78	0.60	
10 ppm "		12.31	10.98	10.15	10.51	9.66	8.96	
<u>CF₃-¹⁴C-RH-6201</u>								
1 ppm Sandy Loam		1.12	0.97	1.04	0.97	1.09	0.90	1.15
10 ppm "		9.96	10.00	9.63	9.05	8.79	9.78	11.48
1 ppm Silt Loam		1.27	1.13	0.97	1.00	0.89	0.81	
10 ppm "		11.18	11.45	10.41	11.06	9.73	9.55	
<u>2,4-D</u>								
1 ppm Sandy Loam		0.89	1.11	0.76	0.82	0.60	0.60	1.23
10 ppm "		9.96	8.52	7.45	7.07	5.54	5.92	12.02
1 ppm Silt Loam		1.14	0.82	0.74	0.64	0.59	0.54	
10 ppm "		10.97	5.82	4.72	4.15	3.45	3.40	

4. Radioanalysis (Total ^{14}C) of Soil and Water Samples - Anaerobic

Sample	Elapsed Days	Residues as PPM Parent Compound					
		0	10	30	60	107	182
<u>COO⁻ - ¹⁴C-RH-6201</u>							
1 ppm Soil		0.85	0.96	1.05	1.06	1.00	0.98
Water		----	0.08	0.01	0.01	0.01	0.01
10 ppm Soil		7.37	8.81	12.93	9.13	10.09	11.35
Water		----	2.70	0.19	0.12	0.12	0.12
<u>CF₃- ¹⁴C-RH-6201</u>							
1 ppm Soil		0.82	0.90	1.16	0.98	0.98	0.89
Water		----	0.09	0.01	0.01	0.01	0.01
10 ppm Soil		6.83	8.70	8.74	10.29	11.23	10.30
Water		----	2.60	0.14	0.13	0.13	0.13
<u>2,4-D</u>							
1 ppm Soil		0.69	0.89	0.84	0.93	0.87	0.68
Water		----	0.08	0.13	0.11	0.09	0.03
10 ppm Soil		5.42	5.69	7.03	8.19	5.12	4.05
Water		----	6.87	5.52	4.86	1.84	0.49

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5. Radioactivity Trapped in NaOH Solutions

<u>Elapsed Days</u>	<u>COO⁻ - ¹⁴C-RH-6201</u>		<u>CF₃ - ¹⁴C-RH-6201</u>	
	<u>1 ppm Soil</u>	<u>10 ppm Soil</u>	<u>1 ppm Soil</u>	<u>10 ppm Soil</u>
	<u>% of</u>	<u>% of</u>	<u>% of</u>	<u>% of</u>
	<u>Remaining</u>	<u>Remaining</u>	<u>Remaining</u>	<u>Remaining</u>

A. Sandy Loam Soil

10	7.31	2.96	1.08	0.42
15	4.33	1.50	1.50	0.45
30	6.68	2.22	2.98	1.13
60	12.28	3.47	6.18	1.95
107	2.30	0.94	1.80	0.73
182	1.05	0.73	1.29	0.75
TOTAL	33.95	11.82	14.83	5.43

B. Silt Loam Soil

10	5.55	2.69	0.97	0.50
15	3.76	0.98	1.73	0.91
30	5.63	1.67	2.92	1.51
60	9.84	3.27	7.21	2.59
107	4.28	1.82	2.95	1.10
182	3.41	1.83	2.90	1.47
TOTAL	32.47	12.26	18.68	8.08

2

6. Aerobic degradation of carboxyl-labeled RH-6201 in sandy loam soil results in complete conversion of the parent to the acid form. The acid form (RH-5781) further degrades resulting in a 23% loss in 182 days. Metabolites RH-4514, RH-4515, and RH-5782 were identified throughout the study but were not found to exceed 4, 6, and 8%, respectively. Unidentified material was also found at levels of 10 - 25% of the initial application. Aerobic degradation of trifluoromethyl-labeled RH-6201 in sandy loam soil was similar.* Results of aerobic metabolism in the silt loam were nearly identical except for the formation of an additional unidentified minor metabolite (less than 3.5%) in the silt loam soil. *except for the formation of RH-670 which peaked at 60 days at 10.2 %

7. Anaerobic metabolism in sandy loam soil of carboxyl-labeled RH-6201 resulted in 81% conversion of the parent to the acid form on day 0, and this acid form dropped to 28% at day 10 and 5% at day 182. The most abundant metabolite at day 182 was RH-4512 at 39%. Metabolite RH-5782 was also present but did not exceed 4.4% throughout the study. There were also four unidentified metabolites (each less than 11%) and 28 - 38% of the material remained at the origin throughout the study. 4515? see end of volume

For trifluoromethyl-labeled RH-6201 results were similar. At day 0, RH-5781 was 76.8% and this dropped to 32% at day 10 and 7% at day 182. The metabolite RH-4514 increased from 2.3% at day 0 to 36.5% at day 60 but dropped to 21% at day 182. Metabolite RH-5782 did not exceed 6% throughout the study. There were also four unidentified metabolites and 20 - 50% of the material remaining at the origin.

8. In sterilized soils the major component was RH-5781 (89 - 93%) after 60 days of incubation. No other metabolite or unidentified TLC spot exceeded 5%.

9. TLC of bound residues identified no new products but did show additional unidentified spots.

9. Summary of Sequential Extraction Results After 182 Days Incubation

<u>Sample</u>	<u>RH-6201 COO⁻-¹⁴C % Total</u>	<u>RH-6201 CF₃-¹⁴C % Total</u>	<u>2,4-D % Total</u>
<u>Soil - Sandy Loam (Aerobic)</u>	100	100	100
Solvent ^a			
Benzene	44.8	47.3	3.3
Methanol	15.4	13.8	5.5
NH ₄ OH, 0.1 N	9.4	11.9	32.1
NaOH, 0.5 N	10.2	13.0	34.2
Residue (humin)	3.6	3.8	11.5
TOTAL Recovered	83.4	89.8	86.6
<u>Soil - Silt Loam (Aerobic)</u>	100	100	100
Solvent			
Benzene	30.1	35.9	4.1
Methanol	22.4	16.8	2.9
NH ₄ OH, 0.1 N	10.0	12.1	21.4
NaOH, 0.5 N	12.2	15.3	38.3
Residue (humin)	4.2	5.1	19.0
TOTAL Recovered	78.9	85.2	85.7
<u>Soil - Anaerobic</u>	100	100	100
Solvent			
Hexane	0.6	1.9	9.0
Benzene	18.9	21.4	7.6
Methanol	7.7	7.3	6.7
HCl, 0.1 N	0.2	0.2	4.5
NaOH, 0.5 N	31.4	30.7	34.6
Residue (humin)	8.7	10.0	19.9
TOTAL Recovered	67.5	71.5	82.3

^a Solvents listed in chronological order of extraction.

10. Summary of Sequential Extraction Results

<u>Sample</u>	<u>RH-6201 COO-¹⁴C % Total</u>	<u>RH-6201 CF₃-¹⁴C % Total</u>	<u>2,4-D % Total</u>
<u>Soil - Sandy Loam (Aerobic)</u>	100	100	100
Solvent ^a			
Benzene	44.8	47.3	3.3
Methanol	15.4	13.8	5.5
NH ₄ OH, 0.1 N	9.4	11.9	32.1
NaOH, 0.5 N	10.2	13.0	34.2
Residue (humin)	3.6	3.8	11.5
TOTAL Recovered	83.4	89.8	86.6
<u>Soil - Silt Loam (Aerobic)</u>	100	100	100
Solvent			
Benzene	30.1	35.9	4.1
Methanol	22.4	16.8	2.9
NH ₄ OH, 0.1 N	10.0	12.1	21.4
NaOH, 0.5 N	12.2	15.3	38.3
Residue (humin)	4.2	5.1	19.0
TOTAL Recovered	78.9	85.2	85.7
<u>Soil - Anaerobic</u>	100	100	100
Solvent			
Hexane	0.6	1.9	9.0
Benzene	18.9	21.4	7.6
Methanol	7.7	7.3	6.7
HCl, 0.1 N	0.2	0.2	4.5
NaOH, 0.5 N	31.4	30.7	34.6
Residue (humin)	8.7	10.0	19.9
TOTAL Recovered	67.5	71.5	82.3

^a Solvent listed in chronological order of extraction.

11.

Fractionation of Humus^a

<u>Sample</u>	<u>RH-6201 COO-¹⁴C % Total</u>	<u>RH-6201 CF₃-¹⁴C % Total</u>	<u>2,4-D % Total</u>
<u>Humus - Sandy Loam (Aerobic)</u>	100	100	100
Fulvic acid	23.6	27.3	49.2
Humic acid	72.1	74.0	58.4
<u>Humus - Silt Loam (Aerobic)</u>	100	100	100
Fulvic acid	54.1	55.6	70.5
Humic acid	42.1	48.4	45.0
<u>Humus - Anaerobic</u>	100	100	100
Fulvic acid	9.4	9.8	42.8
Humic acid	87.2	93.7	72.6

^a The humus data corresponds to the NaOH extracts of results 10, above.

DISCUSSION:

~~1. See Conclusions.~~

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3.5

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Technical

CITATION: Cooke, P.K. (1978). Evaluation of RH-6201 Against Environmentally Important Microorganisms (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA), Acc. No. 097720, Tab 9, p. 196

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: M. Edwards, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 3, 1979

TEST TYPE: Effects of Pesticides on Microbes

CONCLUSIONS:

1. Growth of Nostoc sp., Azotobacter vinelandii, Nitrobacter agilis, Nitrosomonas europea, Pseudomonas aeruginosa, Pseudomonas fluorescens, Aspergillus foetidus and Chaetomium globosum was not observed to be inhibited at the highest concentration of RH-6201 tested. No growth of Bacillus subtilis and Streptomyces albus was observed at the highest RH-6201 level (1000 ppm), and growth of Cellulmonas sp. was prevented at 500 ppm. The most sensitive organism tested was Clostridium pasterianum, for which 125 ppm was found to prevent growth.
2. The minimum inhibitory concentrations of RH-6201 against 12 different soil microorganisms indicate that RH-6201 will not prevent growth of these organisms at recommended application rates. RH-6201 has less bacteriostatic potential than the commercial microbiocide Kathon 886, which had MIC's ranging from 0.06 to 63 ppm.
3. The use of visual determinations alone is not sufficient to determine concentrations at which partial growth inhibition occurs, and this level could be considerably lower than levels causing inhibition. This study does not allow a determination to be made as to whether effects of RH-6201 on microbes will be permanent or temporary.

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MATERIALS AND METHODS:

Minimum inhibitory concentrations (MIC's) were determined against selected soil microorganisms of ecological significance (see Results). MIC's were determined using a two-fold serial dilution procedure to test the effects of RH-6201 at up to 1000 ppm. For most organisms, the effects of the chemical on cultures were determined visually (growth/no growth), although the effects of the compound on Nitrobacter agilis and Nitrosomonas europa were determined by measuring diminishing nitrite levels of the culture media. The commercial microbiocide Kathon 886 (5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one in a 3:1 ratio) was used as a positive control in each experiment.

RESULTS:

1.

Minimum Inhibitory Concentrations of RH-6201 vs.
Ecologically-Important Microorganisms

Test Organism	MIC, ppm AI	
	RH-6201	Kathon 886*
<u>Alga:</u>		
<u>Nostoc sp.</u>	>1000	0.32
<u>Bacteria:</u>		
<u>Azotobacter vinelandii</u>	>1000	2
<u>Bacillus subtilis</u>	1000	4
<u>Cellulomonas sp.</u>	500	4
<u>Clostridium pasteurianum</u>	125	63
<u>Nitrobacter agilis</u>	>1000	0.06
<u>Nitrosomonas europea</u>	>1000	0.06
<u>Pseudomonas aeruginosa</u>	>1000	4
<u>Pseudomonas fluorescens</u>	>1000	4
<u>Streptomyces albus</u>	1000	0.5-1
<u>Fungi:</u>		
<u>Aspergillus foetidus</u>	>1000	8
<u>Chaetomium globosum</u>	>1000	16

*Kathon 886 (5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl 4-isothiazolin-3-one) was included in order to provide a comparison with a broad-spectrum industrial microbicide.

~~DISCUSSION:~~

~~1. See Conclusions~~

3.6

CHEMICAL: Blazer, sodium salt of acifluorfen, carboflurorfen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Fisher, J. D. (1978). Leaching and Mobility Studies in Soil Treated with RH-6201 (unpublished report by Rohm and Haas Inc., Philadelphia, PA, Technical Report No. 34H-78-10), Acc. No. 097719, Tab 11, p. 280

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: David Arieti, Staff Scientist, Enviro Control, Inc., Rockville, MD

DATE OF REVIEW: October 3, 1979

TEST TYPE: Leaching and Mobility Study

CONCLUSION:

1. Soil column leaching data show that RH-6201 leaches similar to 2, 4-D. It moves further in sandy soils than in high organic matter soils. This relative mobility was also confirmed by using soil TLC plates.

MATERIALS AND METHODS:

In the study five types of soils, decribed below, were used.

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	<u>Lawrenceville Silt Loam</u>	<u>Pasquotank Sandy Loam</u>	<u>Lakeland Sand</u>	<u>Hagerstown Clay Loam</u>	<u>Cecil Clay</u>
Organic Matter	2.7	2.1	0.95	1.89	0.44
pH	6.4	5.2	5.0	6.9	4.7
Mechanical Analysis					
% Sand	16	70	98	28	32
% Silt	66	18	0	34	14
% Clay	18	12	2	38	54
Cation Exchange Capacity (meq/100 g)	9.0	8.4	1.7	7.2	6.9
Field Moisture Capacity, %	11.7	13.5	7.1	13.5	14.9
Bulk Density	1.49	1.42	---	1.53	1.50

Glass columns of 2.9 inches ID were filled to 12 inches with all soils except Cecil clay. The columns were prewetted and had aqueous solutions of RH-6201 labeled with carbon-14 at either the trifluoromethyl or nitrophenyl ring applied dropwise to the top of the column at a rate equivalent to 1 lb ai/A. An equivalent of 20 acre inches of water was applied at a constant rate for 60 hours. Leachate fractions were analyzed by direct counting and by extraction with ether after first acidifying the aliquot. After leaching, the soil columns were sectioned and an aliquot from each section combusted. Soil aliquots were also extracted with a variety of solvents and partitioned into different fractions. These different fractions were analyzed by either radioassay or TLC.

RH-6201's mobility was determined on soil TLC plates using the five soils described above and in comparison to labeled 2,4-D and propanol. Visualization was done using X-ray.

RESULTS:

1. Soil column leaching data showed 83 - 98% of the applied activity for both labeled RH-6201 appearing in the leachate. The rest of the activity was spread throughout the 12-inch column.

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2. During the soil leaching experiment the parent converted to RH-5781 (acid form of RH-6201). The following products were found in the leachate: RH-5781, RH-883, AM-669-1, and unknowns. RH-5781 represented 82 - 96% of the activity in the leachate. The other products found in the leachate did not exceed 6.1%. Activity remaining in the soil consisted of RH-5781, RH-883, AM-669-1 and at least three unknowns. Most of the activity, about 80%, was evenly distributed between RH-5781, AM-669-1, and unidentified material remaining at the origin. The remaining 20% consisted of RH-883 and three unknowns.

DISCUSSION:

~~1. See Conclusion~~

3.7

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Technical

CITATION: Fisher, J.C. (1976). Laboratory Leaching Study with Soil-Aged RH-6201 (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-76-13), Acc. No. 095733, Tab 10, p. 600

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: M. Edwards, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 4, 1979

TEST TYPE: Laboratory Leaching Study

CONCLUSIONS:

1. The data indicate that RH-6201 residues containing carbon-14 from the trifluoromethyl or carboxyl groups are unlikely to leach more than a few inches in a sandy loam soil. In the absence of data on the fate of the trifluoromethyl and carboxyl group in soil, it is the reviewer's opinion that ring-labeled compounds should also have been used, and comparisons made between the results obtained with the side-chain labeled preparations. The absence of leached residues in this study could have been due to the simple unavailability of the carbon-14 as a result of adsorption at the soil surface or through volatilization and/or metabolism of the side groups. No RH-6201 metabolites or degradation products were identified in this study.
2. A large amount (approximately 25%) of applied carbon-14 was unaccounted for in the combined soil and leachate radioanalyses. It is considered likely that most of this unaccountable activity was lost through metabolism and/or volatilization during the 45 day leaching period, as indicated by the observation that approximately 40% of the original carbon-14 label added to the soil was lost during the 30-day greenhouse aging period.

MATERIALS AND METHODS:

Two preparations of the experimental herbicide RH-6201 were used, one preparation labeled with carbon-14 in the trifluoromethyl group and the other labeled in the carboxyl group:

Nixonton sandy loam soil (pH 5.5; CEC = 7 meq/100 g; organic matter = 2.59% sand = 71%; silt = 22% and clay = 7%) was fortified to approximately 0.5 ppm with one of the RH-6201 preparations (actual levels were measured as 0.62 and 0.56 ppm for trifluoromethyl and carboxyl label, respectively). Soils were maintained in a greenhouse for 30 days, after which time samples were removed for leaching studies in soil columns, as described below.

Soil columns were filled to a height of approximately 11 inches with Nixonton sandy loam soil, wetted, and overlain with 100 g of one of the 30-day aged soil preparation. One-half inch of water was added dropwise to each column every weekday for the next 45 days. Leachates were collected daily, and alternate days' collections radioassayed. After 45 days the soil columns were divided into 2-inch segments, and analyzed for radioactivity.

Leachates and subsamples from each soil column segment were analyzed for radioactivity by liquid scintillation spectrometry. Limits of detectability for soil samples and leachate samples were 0.002 and 0.001 ppm, respectively.

RESULTS:

1. Soil Column Sections

Radioanalysis of aged soil prior to initiation of soil column studies indicated that total carbon-14 residues had declined approximately 40% during the 30-day aging period. Data from radioassay of soil column segments taken at the termination of the leaching experiments showed, for both RH-6201 preparations, that approximately 70% of the carbon-14 label present in the soil after aging appeared in the top (0-2-inch) segment. No detectable residues were observed beneath the 0-2 inch segments.

2. Leachate from Columns

No detectable residues were observed in any of the drainage water leachate samples collected over the 45-day period.

DISCUSSION:

1. See Conclusions

3.8

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Garstka, T.A. (1978). The Adsorptive and Desorptive Behavior of RH-6201 on Drummer Silt Loam Soil (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-78-4), Acc. No. ~~005733~~, Tab 12, p. 448
097719,

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: M.C. White, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 2, 1979

TEST TYPE: Soil Adsorption and Desorption of a Pesticide

CONCLUSIONS:

1. In this pesticide/soil system, RH-6201's adsorption characteristics are similar to those of 2,4-D, a commonly used model compound. It is adsorbed slightly less than 2,4-D, but desorbs more than 2,4-D.
2. RH-6201 adsorbs and desorbs linearly over the range of experimental equilibrium concentrations, following the Freundlich relationship.
3. Adsorption of RH-6201 is proportionately greater at lower concentrations than at higher concentrations, indicating that moderate adsorption would occur at the recommended application rate. However, less RH-6201 desorbs at the lower concentrations.
4. The experimental procedures used in this study are appropriate for determining the adsorption and desorption behavior of RH-6201 in a typical agricultural soil. However, the combustion data, as presented for carbon-14 mass balance determinations are confusing to the reviewer. It is not clear if the samples are the same as those used for the adsorption/desorption studies.

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5. In this study, the reported adsorption and desorption coefficients are for intercepts ($C_e = 0$) instead of the standard equilibrium concentration ($C_e = 1^e$ ppm). Nevertheless, the coefficients required by EPA guidelines can easily be determined from the reported data. Thus, the protocol and results of this study appear to meet EPA guidelines for pesticide soil adsorption and desorption.

MATERIALS AND METHODS:

Four aqueous RH-6201 solutions (0.1, 1.1, 10 and 123 ppm) were equilibrated (24 hours, 24 C, shaker) with a Drummer silt loam soil (pH 5.2; CEC = 10.1; organic matter = 3.8%; sand = 13%; silt = 65% clay = 22%) at a four to one solution:soil ratio. RH-6201 was labeled with carbon-14 in the trifluoromethyl group. In addition, 2,4-D, ring labeled with carbon-14, was used as a model compound throughout the study.

After centrifugation the supernatant was removed and assayed by liquid scintillation counting. Adsorbed RH-6201 was calculated as the difference between initial and final solution concentrations. Following adsorption, each sample was equilibrated with four successive 10-ml portions of distilled water in a shaker bath at 25 C. The desorbing equilibrium times varied between 6 and 24 hours. After centrifugation the supernatant from each preparation was assayed by liquid scintillation counting. Desorbed RH-6201 was calculated from the difference between the successive residual soil concentrations and that released to the respective equilibrium solutions. After the fourth desorption run the soils were combusted to release the remaining carbon-14. Final mass balances were calculated for RH-6201 at each concentration by using the combustion data and the adsorption/desorption data.

Adsorption and desorption isotherms were prepared by using the logarithmic form of the Freundlich equation. The desorption isotherms represent a composite of the four desorption runs. Adsorption and desorption coefficients (K) were obtained from these graphs at equilibrium solution concentrations (C_e) equal to zero.

RESULTS:1. % Adsorption on Drummer Silt Loam Soil

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
	<u>RH-6201</u>			
Initial Fortification (μg)	1231	101.2	10.61	1.029
μg Adsorbed	400.0	43.6	5.87	0.6291
% Adsorbed	32.5	43.1	55.3	61.1

2,4-D

Initial Fortification (μg)	1049	103.3	10.30	1.012
μg Adsorbed	405.4	53.1	6.42	0.7268
% Adsorbed	38.6	51.4	62.3	71.8

2. Adsorption / desorption by 2.5 gm of Drummer silty loam

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
μg Blazer in 10 ml soln	3077.5	253.0	26.53	2.57
μg Blazer adsorbed by 2.5 gm soil	400	43.6	5.87	0.6291
% adsorbed	13.0 %	17.2 %	22.1 %	24.5 %
μg Blazer desorbed	357.1	33.5	3.37	0.3172
% desorbed	89.3 %	76.8 %	57.4 %	50.4 %

3.

Values for K^1 , $1/n^2$ and Q^3 for ^{14}C -RH-6201 and ^{14}C -2,4-D
for Drummer Silt Loam Soil

RH-6201			2,4-D		
<u>K</u>	<u>1/n</u>	<u>Q</u>	<u>K</u>	<u>1/n</u>	<u>Q</u>
<u>Adsorption</u>					
11.08	0.83	289	13.76	0.84	359
<u>Desorption</u>					
40.19	0.66	1049	88.92	0.63	2322

1 K determined as the antilog of the corresponding value of $\log x/m$ when $\log C_e = 0$
 x/m = amount of adsorbed pesticide (x) per unit amount of adsorbent (m).
 C_e = equilibrium solution concentration of the pesticide.

2 $1/n = \text{slope } \frac{\log C_2 - \log C_1}{\log x/m_2 - \log x/m_1}$

3 $Q = \frac{K \times 100}{\% \text{ Soil Organic Matter}}$

3. Total recoverable carbon-14 from adsorption, desorption, and soil combustion, ranged from 92 to 97% for the four RH-6201 concentrations.

DISCUSSION-

~~1. See Conclusions.~~

3.9

- CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH-36201, RH-6201)
- FORMULATION: Carbon-14 labeled material
- CITATION: Rogerson, T.D. (1978). A Residue Decline Study of Soil Treated with ¹⁴C-RH-6201 at Newtown, PA, in 1977 (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-78-19), Acc. No. 097719, Tab 13, p. 575
- TRADE SECRET CLAIM: Yes
- REASON FOR REVIEW: Registration Standard
- REVIEWED BY: M. Edwards, Staff Scientist, Enviro Control, Inc. Rockville, MD
- DATE OF REVIEW: October 2, 1979
- TEST TYPE: Residue Decline Study
- CONCLUSIONS: -
1. The data indicate that RH-6201-derived residues will decline during the growing season in the upper 3 inches of surface treated soil by a factor between approximately 6 and 10, when compared with levels measured immediately after treatment. Half-lives based on the 0-3 inch soil core were 29, 44, and 35 days for the nitrophenyl ring-, trifluoromethyl- and carboxyl-labeled compounds, respectively. Leaching of radioactive residues into the 3-6 and 6-12 inch soil depths was observed, but, after 110 days, levels ranged from 0.01 to 0.06 ppm at the 3-6 inch soil depth, and were undetectable at the 6-12 inch depth.
 2. A portion of the radioactive residue (that portion undetected by GLC) was associated with humic acid, fulvic acid, and humin fractions of the soil in the form of bound and/or highly metabolized polar compounds. The amine metabolite of RH-6201 (RH-4514) may have been present but at levels no greater than 0.02 ppm.

3. The data show that residues in previously treated plots were between two and four times the residues in the previously untreated plot in the 0-3-inch soil layer) after 110 days. In addition, detectable residues were measured (approximately 0.17 ppm in the 0-3-inch soil layer) prior to treatment in the test plots where RH-6201 had been applied the previous year, but were undetectable in the previously untreated plot. These findings suggest to the reviewer that buildup of RH-6201 residues in soil following yearly applications may occur.

MATERIALS AND METHODS:

Three preparations of RH-6201 were used, one labeled with carbon-14 in the trifluoromethyl group, another labeled in the carboxyl group and the third uniformly labeled in the nitrophenyl ring.

Each RH-6201 preparation was dissolved in deionized water and applied to the appropriate test plot at 1 lb ai/A. Plots treated with trifluoromethyl- and carboxyl-labeled preparations had been treated the previous year with the same respective compound at the same application rate. The third plot, receiving the nitrophenyl-ring-labeled compound, had not been previously treated. The soil was classified as an Abbottstown silt loam (pH 7.11; CEC = 1.54 meg/100g; organic matter = 4.7%; sand = 0.0%; silt = 45.6%; clay = 33.2%).

Soil core samples were taken five times during the growing season. The samples were mixed, weighed and combusted, and evolved carbon dioxide was trapped and radioassayed by liquid scintillation. Pre-treatment levels of RH-6201 were also determined for each plot, and for plots receiving trifluoromethyl- and carboxyl-labeled compounds, RH-6201 levels were determined immediately after treatment.

RESULTS:

1. An upper limit of 0.02 ppm for residues due to the amine metabolite (RH-4514) for all samples was noted, but no data were presented.

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2. Summary of Radioactive Residue Levels
for Soil (Calc. as ppm RH-6201)

Label Position	TSI (days)	0-3"		3-6"		6-12"	
		Combustion Residue	RH-6201 (by GLC)	Combustion Residue	RH-6201 (by GLC)	Combustion Residue	RH-6201 (by GLC)
NO ₂ Ring	0*	NDR					
	11	1.76	0.51	NDR	0.05	NDR	0.05
	21	0.96	----	0.08	----	0.05	----
	39	0.42	----	0.02	----	0.01	----
	70	0.61	----	0.01	----	NDR	----
	110	0.12	0.01	NDR	----	0.01	----
CO	0*						
	11	0.17		0.06	0.02	NDR	----
	21	2.72					
	39	1.16					
	70	1.54					
	110	0.37					
CF ₃	0**	0.43					
	11	0.28					
	21						
	39						
	70						
	110						
	0*	0.18					
	11	2.84					
	21	0.77					
	39	2.53					
	70	0.64					
	110	1.00					
	0**	0.47					
	11						
	21						
	39						
	70						
	110						

NDR = No Detectable Residue.

* = Before Treatment

** = After Treatment

3.10

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Augenstein, L.L. (1976). A Residue Decline Study of Soybeans Treated Preemergence or Postemergence with ¹⁴C-RH-6201 at Newtown, PA, (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-76-19), Acc. No. 095734, Tab 4, p. 164

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: Sandra Gould, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: September 27, 1979

TEST TYPE: Field Dissipation Study

MATERIALS AND METHODS:

RH-6201, labeled with carbon-14 at either the trifluoromethyl-group or the carboxyl-group, was applied at 2.0 lbs ai/A as a preemergence spray and at 1.0 lb ai/A as a postemergence spray. Soil samples from 0-2, 2-4 and 4-6 inches were collected six times after treatment. The samples were combusted and carbon dioxide was determined by standard liquid scintillation counting techniques.

Note: Since this soil data is submitted as part of a study required by other branches in HED, the data is assumed to not have been developed to satisfy EFB data requirements. The soil data was, therefore, not given a full registration review but was reviewed briefly for purposes of comparing the results with the results of data required and reviewed by EFB.

RESULTS:

1.

Radioactive Residues in Soil

Depth of Sample:
Site of ¹⁴C Label:

		<u>0-2 inches</u>		<u>2-4 inches</u>		<u>4-6 inches</u>	
		<u>CF₃</u>	<u>COO⁻</u>	<u>CF₃</u>	<u>COO⁻</u>	<u>CF₃</u>	<u>COO⁻</u>
<u>Treatment Type</u>	<u>TSI¹</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>
Preemergence 2 lb/A	0	10.21	4.60	-	-	-	-
	14	2.03	1.16	0.15	0.03	0.03	0.04
	28	-	0.57	-	0.04	-	0.05
	56	1.85	0.56	0.05	0.21	0.03	0.24
	84	1.85	1.27	0.18	0.11	0.01	0.03
	125	1.48	1.00	0.15	0.42	0.24	0.07
<u>Treatment Type</u>		<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>
Postemergence 1 lb/A	0	0.79	1.00	-	-	-	-
	14	0.43	0.56	0.05	0.02	0.01	0.01
	28	0.73	0.73	0.11	0.15	0.03	0.57
	56	0.26	0.20	0.05	0.04	0.08	0.09
	84	0.29	0.56	0.01	0.08	NDR ³	0.09
	125	1.25	0.47	0.05	0.16	0.007	0.02

¹ TSI = Treatment-to-Sampling Interval in Days

² ppm Calculated as RH-6201

³ NDR = No Detectable Residue

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3.11

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Augenstein, L.L. (1976). A Residue Decline Study On Soybean Treated Preemergence or Postemergence with ¹⁴C-RH-6201 (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 3423-76-15), Acc. No. 095734, Tab 3, p. 40

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: W. Chou, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 1, 1979

TEST TYPE: Field Dissipation Study

MATERIALS AND METHODS:

RH-6201 labeled with carbon-14 at either the trifluoromethyl carbon or the carboxyl carbon was applied at 1.0 lb ai/A to separate rows of soil, both preemergence and postemergence. Core samples (0-2 and 2-6 inches) of the soil were taken periodically after treatment.

Note: Since this soil data is submitted as part of a study required by other branches in HED, the data is assumed to not have been developed to satisfy EFB data requirements. The soil data was, therefore, not given a full registration review but was reviewed briefly for purposes of comparing the results with the results of data required and reviewed by EFB.

RESULTS:

1.

Radioactive Residues in SoilTreatment Type:
Site of ^{14}C Label:

Preemergence	
CF_3 Group	COOH Group

Postemergence	
CF_3 Group	COOH Group

<u>TSI¹</u>	<u>Depth of Sample</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>	<u>ppm²</u>
0	0-2"	0.62	0.59	1.89	1.87
14	0-2"	0.96	0.68	1.43	1.27
14	2-6"	0.52	0.21	0.45	0.53
28	0-2"	0.98	0.88	0.96	0.79
28	2-6"	0.53	0.50	0.25	0.61
57	0-2"	0.88	0.63	0.58	0.96
57	2-6"	0.82	0.29	0.55	0.14
82	0-2"	0.41	0.43	0.49	0.70
82	2-6"	0.64	0.41	0.28	0.34
112	0-2"	0.35	0.35	0.47	0.53
112	2-6"	0.38	0.31	0.22	0.25

¹ TSI = Treatment-to-Sampling Interval in days² ppm calculated as RH-6201

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3.12

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH36291, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Augenstein, L. L. (1976). ¹⁴C Residue Studies on Rotation Crops Grown in Plots Treated with ¹⁴C-RH-6201 (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-76-9), Acc. No. 095733, Tab 8, p. 495.

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: Ronald L. Schaefer, Staff Scientist, Enviro Control, Inc., Rockville, MD

DATE OF REVIEW: October 9, 1979

TEST TYPE: Rotational Crop Uptake Study

CONCLUSIONS:

1. Residues were not identified in soil or plant samples. However, due to the low levels of residues found, the reviewer would not expect identification to be possible. For residues to be identified, the application rate would have to exceed a rate that was two to four times the recommended application rates used in this study.
2. Under actual use conditions, the reviewer concludes that carbon-14 residues above 0.05 ppm would not be found in rotational crops (collards, corn, barley) 4 months after treatment. An exception would be carrot tops, which would show total carbon-14 residues of about 0.1 ppm when planted, 4 months after treatment, and harvested 7-10 weeks later.
3. Soil residues declined between 4 and 8 months post treatment from about 0.6 to 0.2 ppm.

MATERIALS AND METHODS:

Silt loam soil (pH 8.3; CEC = 20.9 meq/100 g; organic matter = 6.1%; sand = 0.0%; silt = 41.5%; clay = 50.3%) was treated with RH-6201 labeled with carbon-14 either in the carboxyl group or in the trifluoromethyl group at a rate of 1 lb ai/A, applied to the soil as either a preemergence or a postemergence spray to soybeans.

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Six days after soybean harvest (118 days after treatment), the plots were fertilized, rototilled, raked and planted with collards and carrots. Barley and corn were planted 134 and 148 days after treatment, respectively.

Rotational crops were sampled at 30 - 40-day intervals from planting through final harvest. All plant samples were homogenized with dry ice, combusted, and the activity counted by standard liquid scintillation counting (LSC) techniques.

Soil samples were taken and the activity counted by LSC.

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RESULTS:1. Radioactive Residues in Rotation Crops and Soil

(ppm calculated as RH-6201)

Treatment Type: Site of ¹⁴ C Label: lb ai/A:			Preemergence		Postemergence	
			CF ₃ Group	COO ⁻ Group	CF ₃ Group	COO ⁻ Group
			1.0	1.0	1.0	1.0
Sample	Component	TSI ^a	ppm	ppm	ppm	ppm
Collards	Foliage	158	---	0.024	0.078	---
	Foliage	189	---	0.036	0.040	---
	Foliage	223	---	0.011	0.049	---
Carrots	Top	167	---	0.049	0.200	---
	Top	189	---	0.017	0.140	---
	Top	223	---	0.027	0.064	---
	Root	223	---	0.010	0.045	---
Barley	Foliage	189	0.065	---	---	0.020
	Foliage	223	0.034	---	---	0.021
	Foliage	246	0.019	---	---	0.036
Corn	Foliage	189	0.034	---	---	0.006
	Foliage	214	0.034	---	---	0.014
	Immature Ears	214	0.007	---	---	NDR ^b
	Foliage	223	0.037	---	---	0.008
	Immature Ears	223	0.011	---	---	NDR
Soil	0 - 3"	118	0.33	0.66	0.59	0.70
Soil	0 - 2"	246	0.21	0.19	0.27	0.14
Soil	2 - 6"	246	0.16	0.14	0.10	0.20

TSI^a - Treatment-to-Sampling Interval in days.NDR^b - No Detectable Residue (<0.003 ppm for COO⁻, <0.004 ppm for CF₃)

47

3.13

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Augenstein, L.L. (1976). ¹⁴C Residue Studies on Rotation Crops Grown in Plots Treated with ¹⁴C-RH-6201 at Newtown, PA, (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-76-21), Acc. No. 095733, Tab 9, p. 558

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: Ronald L. Schaefer, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 9, 1979

TEST TYPE: Rotational Crop Uptake Study

CONCLUSIONS:

1. Residues were not identified in soil or plant samples. For residues to be identified the application rate would have to exceed that used in this study which was four to eight times the recommended application rate.
2. Under actual use conditions, the reviewer concludes that carbon-14 residues above 0.08 ppm would not be found in turnips planted 2 months after treatment and harvested 1 to 2 months later, and residues would not be expected to exceed 0.02 ppm in the mature turnip roots. Residues in mature kale planted 2 months after treatment would not be expected to exceed 0.2 ppm, but would be less in immature foliage. Winter wheat planted 3 months after treatment would show residues to 0.07 ppm in 27-day foliage; older winter wheat samples were not taken and analyzed in this study.
3. Soil residues declined between 0 and 4 months post treatment from about 4.5 to 0.4 ppm.

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MATERIALS AND METHODS:

A field plot (soil data was absent) was treated with RH-6201 labeled with carbon-14 either in the carboxyl group or the trifluoromethyl group at a rate of 2 lb ai/A and applied as a spray on a prepared seed bed. The field remained fallow for 56 days after treatment. It was then rotillled to a depth of 4 inches, fertilized, raked lightly, and planted with turnips and kale. Winter wheat was planted 98 days after treatment. Turnip and kale were sampled at 28, 56 and 69 days after planting; winter wheat was sampled 27 days after planting.

All plant samples were homogenized, combusted and the activity counted by standard liquid scintillation counting (LSC) techniques.

Soil samples were taken, combusted and the activity counted by LSC.

RESULTS:1. Radioactive Residues in Rotation Crops and Soil

Site of ^{14}C Label: 1b ai/A		CF_3 Group 2.0		COO^- Group 2.0
<u>Sample</u>	<u>Component</u>	<u>TSI^a</u>	<u>ppm^b</u>	<u>ppm^b</u>
Turnips	top ^{25 3/5}	84	0.13	0.25
	top	112	0.32	0.03
	root	112	0.06	0.01
	top	125	0.04	0.11
	root	125	0.02	0.04
Kale	foliage	84	0.15	0.40
	foliage	112	0.77	0.02
	foliage	125	0.05	0.15
Winter Wheat	foliage	125	0.06	0.28
Soil	0-2"	0	3.87	5.36
	0-2"	56 ^c	0.65	0.90
	2-4"	56 ^c	0.20	0.02
	4-6"	56 ^c	0.25	0.04
	0-4"	56 ^d	0.82	0.73
	0-4"	125	0.46	0.22
	4-6"	125	0.01	0.02

a. TSI = Treatment-to-Sampling Interval in days

b. ppm calculated as RH-6201

c. Samples collected prior to rototilling

d. Samples collected after rototilling

DISCUSSION:

- 1.
- ~~See Conclusions.~~

3.14

CHEMICAL: Blazer, sodium salt of acifluorfen carbofluorfen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Rogerson, Thomas D. (1978). ¹⁴C Residue Studies on Rotation Crops from Plots Treated with ¹⁴C-RH-6201 at Newtown, PA (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-78-7), Acc. No. 097721, Tab 16, p. 891.

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: Ronald L. Schaefer, Staff Scientist, Enviro Control, Inc., Rockville, MD

DATE OF REVIEW: October 10, 1979

TEST TYPE: Rotational Crop Uptake Study

CONCLUSIONS:

1. The registrant did not identify which results correspond to which of the two (1 or 2 lb ai/A) application rates. The reviewer will treat the data as if only the 1 lb ai/A results were reported (1 lb ai/A is two to four times the recommended label rate).
2. Residues were not identified in soil or plant samples. However, due to the low levels of residues found, the reviewer would not expect identification to be possible. For residues to be identified the application rate would have to exceed a rate that two to four times the recommended application rates used in this study.
3. Under actual use conditions, the reviewer concludes that carbon-14 residues above 0.06 ppm would not be found in rotational crops (lettuce, turnips, cotton, corn), planted 11 months after treatment and harvested at maturity. Residues in kale planted 2 months after treatment would be expected to be 0.03 ppm 10 to 11 months later (over-wintered). Winter wheat planted 3 months after treatment would not take up residues in excess of 0.15 ppm in any aerial plant part harvested at maturity.
4. Soil residues showed no decline between 10 and 17 months post treatment, and during this interval were in the range of 0.1 to 0.3 ppm in the upper 3 inches. It is stressed that the initial application is not known from the data presented, but is either 1 or 2 ai/A.

MATERIALS AND METHODS:

Silt loam soil (pH 7.1; CEC = 1.54 meq/100 g; organic matter = 4.7%; sand = 0.0%; silt = 45.6%; and clay = 33.2%) was treated with tri-fluoromethyl-labeled or carboxyl-labeled RH-6201 applied preemergence or postemergence at a rate of 1.0 or 2.0 ai/A and planted with soybeans. One-half of each field plot used for a fallow-field residue-decline study was rototilled and raked smooth 56 days after treatment. Kale was then planted on one-half of this plot, and winter wheat was planted 98 days after treatment. The remaining plots were used for a soybean residue-decline study. The soybeans were harvested 309 days after treatment and the field was rototilled and raked smooth. Lettuce and turnips were then planted. In addition, corn was planted and cotton seedlings (ca. 4 - 5 weeks old) were transplanted 345 days after treatment on these plots. Crop components were sampled at periodic intervals as indicated in results.

All crop samples were homogenized, combusted and the activity counted by standard liquid scintillation counting (LSC) techniques.

Soil samples were taken, combusted, and the activity counted by LSC.

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RESULTS:

1.	<u>Sample</u>	<u>Component</u>	<u>TSI</u>	<u>COO⁻</u>	<u>CF₃</u>
	Lettuce	Plant	373	0.04 - 0.08	0.01 - 0.03
			387	0.04 - 0.07	0.05 - 0.11
			407	0.07 - 0.08	
			426	0.04 - 0.08	0.04 - 0.07
	Turnips	Roots &			
		Tops	345	0.02 - 0.06	0.02 - 0.05
		Tops	373	0.04 - 0.11	0.01 - 0.03
		Roots	373	NDR ¹ - 0.02	NDR ¹ - 0.01
		Tops	387	0.01 - 0.05	0.02 - 0.12
		Tops	398	0.01 - 0.04	NDR ¹ - 0.04
		Tops	427	0.01 - 0.05	0.01 - 0.03
	Cotton	Plant	373	NDR ¹	NDR ¹
		Seeds	497	0.02 - 0.03	0.01 - 0.02
	Corn	Plant	373	0.02	0.01
		Grain	497	0.03	0.01 - 0.02
	Kale	Plant	317	0.05	NDR ¹
			331	0.06	0.02
	Winter wheat	Plant	317	0.15	NDR ¹
		Grain	317	0.07	NDR ¹
		Plant	331	0.22	0.03
		Grain	331	0.10	0.02
		Chaff	331	0.30	NDR ¹
	Soil	0 - 3"	309 ²	0.10 - 0.51	0.39 - 0.41
			309	0.18 - 0.36	0.22 - 0.23
			373	0.15 - 0.16	0.20 - 0.23
			425	0.11 - 0.27	0.20 - 0.66
			498	0.10 - 0.26	0.20 - 0.29
		3 - 6"	309 ²	0.08 - 0.18	0.05 - 0.06
			373	0.03 - 0.04	0.01 - 0.02
			425	0.01 - 0.02	NDR ¹ - 0.02
			498	0.08	NDR ¹ - 0.17
		6 - 12"	373	0.01	0.01 - 0.02
			425	NDR ¹ - 0.01	NDR ¹
			498	0.02	NDR ¹

1 - No Detectable Residue

2 - Before Tilling

DISCUSSION:1. ~~See Conclusions.~~

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3.15

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Rogerson, T. D. (1978). ¹⁴C - Residue Studies on Rotation Crops from Plots Treated with ¹⁴C-RH-6201 at Newtown, PA, in 1977 (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-78-23), Acc. No 097721, Tab 17, p. 1022

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: Ronald L. Schaefer, Staff Scientist, Enviro Control, Inc., Rockville, MD

DATE OF REVIEW: October 10, 1979

TEST TYPE: Rotational Crop Uptake Study

CONCLUSIONS:

1. Residues were not identified in plant samples. However, due to the low levels of residues found, the reviewer would not expect identification to be possible. For residues to be identified, the application rate would have to exceed a rate that was two to four times the recommended application rates used in this study.
2. Under actual use conditions the reviewer concludes that carbon-14 residues above 0.04 ppm would not be found in rotational crops, (lettuce, turnips, oats, and corn) planted 10 - 12 months after treatment. This is true for oats and corn at maturity and for the other rotational crops used in this study throughout their growing season.

MATERIALS AND METHODS:

Soil plots (soil characteristics are given in Technical Report No. 34H-78-5, a study not included in the data package) were treated with RH-6201 labeled with carbon-14 either in the trifluoromethyl group or in the nitrophenyl ring at a rate of 1 lb ai/A.

One-half of one plot, used for a fallow-field residue decline study, was rototilled to a depth of 6 inches, raked smooth 142 days after treatment, and planted with winter wheat.

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The other half was treated similarly 311 days after treatment and planted with lettuce and turnip. Oats and corn were planted 335 and 353 days, respectively, after treatment. Crops were samples periodically, as shown in results.

All plant samples were homogenized with dry ice, combusted, and the activity counted by standard liquid scintillation counting techniques.

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RESULTS:

1.

¹⁴C-Residue Levels for Rotational Crops
(calc. as ppm RH-6201)

<u>Sample Type</u> <u>(Label Position)</u>	<u>Component</u>	<u>TSI¹</u>	<u>Residue</u> <u>(ppm)</u>
Winter Wheat (NO ₂ Ring)	Plant	288	0.08
	Plant	337	0.01
	Plant	354	0.01
	Grain	370	0.02
	Chaff	370	0.02
	Stalk	370	0.04
	Grain	379	0.02 ²
	Chaff	379	0.02 ²
	Stalk	379	0.04 ²
Lettuce (NO ₂ Ring)	Plant	337	0.01
		347	0.01
		361	NDR ³
		379	NDR
		391	0.01 ²
Lettuce (CF ₃)	Plant	337	0.01
		347	0.01
		361	NDR
		379	NDR
		391	NDR ²
Turnips (NO ₂ Ring)	Plant	337	0.01
		347	NDR
		361	NDR
	Top	379	0.01
	Root	379	NDR
	Top	391	0.01
	Root	391	NDR
	Root	431	0.01 ²
	Top	431	0.01 ²
	Plant	337	0.01
Turnips (CF ₃)		347	0.01
		361	0.01
	Top	379	0.01
	Root	379	NDR
	Top	391	0.01
	Root	391	0.01
	Root	413	0.01 ²
	Top	413	NDR ²
	Grain	428	0.02 ²
	Chaff	428	0.02 ²
Oats (NO ₂ Ring)	Stalk	428	0.04 ²
	Grain	428	0.03 ²
	Chaff	428	0.05 ²
Oats (CF ₃)	Stalk	428	0.08 ²
	Grain	428	0.01 ²
	Grain	428	0.04 ²

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- 1 TSI - Treatment to Sampling Interval (days)
- 2 Final Harvest Sample
- 3 NDR - No Detectable Residue

DISCUSSION:

- ~~1. See Conclusions.~~

3.16

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly, RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: EG&G Bionomics. (1977). Accumulation and Elimination of ¹⁴C-Residues by Bluegill Sunfish (Lepomis macrochirus) Exposed to Two ¹⁴C-Labeled Forms of RH-6201, (unpublished report by EG&G Bionomics, Wareham, MA, Technical Report No. 34-28), Acc. No. 097722, Tab 19, p. 1231

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: David Arieti, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 2, 1979

TEST TYPE: Fish Accumulation

CONCLUSIONS:

1. The data in this study indicate that RH-6201 residues will not exceed a seven-fold accumulation in whole bluegill after 30 days continuous exposure to 0.5 ppm RH-6201. More than 85% of this will be eliminated after 2 weeks of depuration.
2. Due to the low levels of accumulation, residues were not identified.

MATERIALS AND METHODS:

A modified, intermittent flow, proportional diluter was used to deliver well water to three 50-liter glass aquaria which were aerated and maintained at 18 C. The system was timed and calibrated to deliver 1 liter of well water per cycle to each aquarium at a rate of 5 liters per hour. Duplicate introduction systems, each comprised of an injector mechanism and a 50-ml glass syringe were calibrated to introduce 78 and 76 µl, respectively, of RH-6201 labeled with carbon-14 at either the trifluoromethyl carbon or nitrophenyl-ring, with each cycle of the diluter.

Bluegill sunfish, Lepomis macrochirus (N=300), each weighing 3.2 ± 1.0 g and acclimated for 30 days prior to initiation of the study, were transferred to each of the three aquaria. Fish were fed dried pelleted food ad libitum throughout the study and fecal material was siphoned from the aquaria twice weekly. Exposure was continuous for 30 days and was followed by 14 days of depuration.

Water was sampled during exposure and analyzed by LSC. Also, fish were sampled from each exposure tank, eviscerated and filleted. Additionally, on days 3, 10, 22 and 30 of exposure, 50 fish were removed from each exposure aquarium and eviscerated. Vicera and carcasses were pooled, frozen and shipped to Rohm and Haas for possible metabolite identification. Fish were also sampled on days 14 and 30 of exposure to quantitate hexane- and methanol-extractable carbon-14 residues in muscle. Fish tissue samples were analyzed by standard liquid scintillation methods.

RESULTS:

1. Hexane Extractions of Muscle Tissue

<u>CF₃ Label</u>	<u>% extracted on</u>		<u>NPR Label</u>	<u>% extracted on</u>	
	<u>day 14</u>	<u>day 30</u>		<u>day 14</u>	<u>day 30</u>
Hexane	16	18	Hexane	28	30
Methanol	52	67	Methanol	41	64
Non-extractable	15	32	Non-extractable	20	<8

2. Maximum Bioaccumulation Factor in Bluegill

<u>Fish part</u>	<u>Site, of labeling</u>	
	<u>CF₃</u>	<u>NPR</u>
Edible/Muscle	<1.0	<1.0
Non-edible/vicera	14.0	41.0
Whole Fish	<1.0	7.0

3. Mean measured ^{14}C -residues, calculated as RH-6201, in water and bluegill sunfish (*Lepomis macrochirus*) during 30 days of continuous aqueous exposure to a nominal concentration of 0.50 mg/l CF_3 -labeled ^{14}C -RH-6201 and during a 14-day depuration period.

Period	Day	Conc. in water (mg/l) _{a/}	^{14}C -residue concentrations (mg/kg)		
			muscle _{b/}	viscera _{c/}	whole fish _{d/}
Exposure	0	0.49			
	1	0.48	<0.12*	1.1	<0.21*
	3	0.50	<0.11*	2.5	<0.37*
	7	0.50	<0.13*	6.8	<0.87*
	10	0.52	<0.10*	6.3	<1.1*
	14	0.52	<0.11*	4.3	<0.56*
	22	0.52	0.10	2.9	0.46
	30	0.50	0.10	2.6	0.41
Depuration	1		<0.10*	2.2	<0.34*
	3		<0.10*	1.1	<0.17*
	7		<0.11*	0.60	0.22
	10		<0.12*	0.74	<0.24*
	14		<0.09*	0.52	0.17

- a. Three samples
 b. Ten samples
 c. Five samples
 d. Two samples

* Denotes at least one observation was less than the minimum detectable limit.

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4. Mean measured ^{14}C -residues, calculated as RH-6201, in water and bluegill sunfish (*Lepomis macrochirus*) during 30 days of continuous aqueous exposure to a nominal concentration of 0.50 mg/l NPR-labeled ^{14}C -RH-6201 and during a 14-day period.

Period	Day	Conc- in water (mg/l) a/	^{14}C -residue concentrations (mg/kg)		
			Muscle b/	Viscera c/	Whole fish d/
Exposure	0	0.47	-	-	-
	1	0.51	<0.26*	9.2	1.3
	3	0.54	0.50	14	2.4
	7	0.65	0.28	23	3.8
	10	0.52	0.30	15	3.0
	14	0.55	<0.30*	11	1.8
	22	0.66	0.28	14	1.8
	30	0.58	0.31	16	2.1
Depuration	1		<0.14*	6.9	0.68
	3		<0.08*	1.4	<0.35*
	7		<0.11*	<0.27*	<0.11*
	10		<0.10*	<0.28*	<0.12*
	14		<0.09*	<0.28*	<0.10*

a Three samples

b Ten samples

c Five samples

d Two samples

* Denotes at least one observation was less than the minimum detectable limit

DISCUSSION

~~1. See Conclusions~~

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3,17

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Iwan, G. R. (1978). ¹⁴C-RH-6201 Channel Catfish, Ictalurus punctatus (Rafinesque) Bioconcentration Study (unpublished report by Union Carbide Corporation Environmental Services Division, for Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34-28), Acc. No. 097722, Tab 19, p. 1328

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: David Arieti, Staff Scientist, Enviro Control, Inc., Rockville, MD

DATE OF REVIEW: October 10, 1979

TEST TYPE: Fish Accumulation

CONCLUSIONS:

1. The catfish study is not acceptable.
2. A portion of the experiment was curtailed because there was a high mortality due to an epizootic affecting all groups. The epizootic might have influenced some of the data in the following ways:
 - a) the unnecessary stress put upon the fish possibly caused increased or decreased carbon-14 residue uptake
 - b) the epizootic may have contributed to metabolism of the parent compound
 - c) it is also noted that accumulation was still increasing at the time of termination of the experiment.
3. Although accumulated residues were lost during depuration, no firm conclusions can be drawn because of the reasons stated above.

MATERIALS AND METHODS:

RH-6201 labeled with carbon-14 at the trifluoromethyl group or the nitrophenyl ring was added at 2 lb ai/A to sandy loam soil (pH = 5.2; CEC = 8.4; organic matter = 2.1%; sand = 70%; silt = 18% and clay = 12%). The soil was aged 40 days and subsequently flooded with water and allowed to age for another 3 days. Catfish weighing 6.2 ± 1.0 g (N = 350)

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were added to the test pools for 28 days. Owing to high mortalities from infestation in all groups, including controls, the ring-labeled experiment was terminated on day 20 and surviving fish were transferred to the depuration system. The trifluoromethyl-labeled experiment completed the 28 days of exposure before depuration. Residues were determined in soil, water, and fish samples. Degradation products were characterized from catfish by Rohm and Haas from samples taken during the static catfish study.

Samples of soil, water, and fish were prepared for radioassay and TLC by extraction procedures using a solution of acetonitrile/water/hydrochloric acid for soil and fish, and ether/hydrochloric acid for water. Aliquots were counted in a scintillation counter and were analyzed by TLC.

RESULTS:

1. Mortalities averaged 20% and the author asserted that the epizootic did not influence uptake of carbon-14.
2. Mean ^{14}C -CF₃-RH-6201 Soil, Water, and Catfish* Residues

<u>Period</u>	<u>Day</u>	<u>Total ^{14}C Residues, Calc. as ppm RH-6201</u>				
		<u>Soil</u>	<u>Water</u>	<u>Fish</u>		
				<u>Whole</u>	<u>Edible</u>	<u>Nonedible</u>
Soil Aging	0	7.41				
	1	6.77				
	10	6.23				
	30	6.85				
	40	6.28				
Fish Exposure	1	7.17	0.04	0.12	0.07	0.09
	3	4.12	0.05	0.19	0.04	0.10
	7	4.48	0.06	0.17	0.07	0.26
	10	3.69	0.08	0.18	0.02	0.26
	14	4.02	0.12	0.35	0.10	0.53
	21	4.05	0.10	0.25	0.15	0.44
	28	3.11	0.11	0.69	0.38	0.92
Depuration	1			0.71	0.11	0.46
	3			0.52	0.15	0.25
	7			0.17	0.06	0.20
	14			0.04	0.03	0.06

* - Catfish were parasitized

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3. Mean ^{14}C -NPR-RH-6201 Soil, Water, and Catfish* Residues

<u>Period</u>	<u>Day</u>	<u>Total ^{14}C Residues, Calc. as ppm RH-6201</u>				
		<u>Soil</u>	<u>Water</u>	<u>Whole</u>	<u>Fish</u> <u>Edible</u>	<u>Nonedible</u>
Soil Aging	0	5.10				
	1	4.97				
	10	4.22				
	30	5.22				
	40	5.28				
Fish Exposure	1	3.40	0.03	0.05	0.09	0.03
	3	3.37	0.04	0.09	0.02	0.08
	7	4.64	0.06	0.16	0.03	0.19
	10	1.46	0.07	0.22	0.06	0.24
	14	1.86	0.11	0.14	0.04	0.29
	21	2.85	0.10	0.35	0.16	0.61
Depuration	1			0.26	0.04	0.33
	3			0.18	0.06	0.21
	7			0.03	0.02	0.05
	14			0.02	0.01	0.01

* - Catfish were parasitized

4. The control catfish were also parasitized.

~~DISCUSSION.~~~~1. See Conclusions.~~

3.18

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH-36201, RH-6201)

FORMULATION: Technical

CITATION: Caplan, J., and K. Schroader. (1978). ¹⁴C-RH-6201 Activated Sludge Metabolism (unpublished report prepared by Biospherics Inc. for Rohm and Haas Co., Philadelphia, Laboratory Report No. 7PL-1-1), Acc. No. 097720, Tab 10, p. 212

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: M. Edwards, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 9, 1979

TEST TYPE: Activated Sludge Metabolism Study

CONCLUSIONS:

1. Physical measurements (pH, temperature, dissolved oxygen, and suspended solids) failed to show any effect of labeled RH-6201 on the tested activated sludge system at up to 100 ppm. This was confirmed by plate counts for total organisms, yeasts, and actinomycetes.
2. Most added RH-6201 (over 90%) remained in the supernatant, unadsorbed to the solids. Minor amounts (less than 0.5%) of labeled carbon dioxide were evolved, and even lower amounts of carbon-14 volatiles were detected. The data showed that little or no degradation of RH-6201 occurred in this activated sludge system, indicating that most RH-6201 would pass through the activated sludge system unchanged.
3. No data were provided on the nature of the activated sludge used, except for a comment that the plant from which the sludge was obtained treats mainly industrial, as opposed to municipal waste. In the reviewer's opinion, information should have been provided on the types of waste being treated at this plant or on the characteristics of the sludge used. In the absence of this type of data, the results of this study can only be safely interpreted to cover the situation which might arise at the plant from which the sludge was obtained (Back River Sewage Treatment Plant, Dundalk, MD).
4. *This study is not required for the proposed soybean use, but is reviewed here for 6a2 purposes only. Should a future use of Blazer be proposed requiring an activated sludge study, then this data will have to be resubmitted or referenced*

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and then reviewed for registration purposes.

MATERIALS AND METHODS:

Two preparations of the test compound RH-6201 were used, one labeled with carbon-14 in the trifluoromethyl group and the other with the label in the nitrophenyl ring.

Activated sludge was obtained from a facility treating primarily industrial wastes (Back River Sewage Treatment Plant, Dundalk, Maryland). Suspended solids were adjusted to 2.5 g/l. Aeration chambers (operating volume = 2,100 ml) were each charged with 700 ml of the activated sludge suspension and 1,400 ml of synthetic sewage solution (nutrient). The activated sludge, nutrient solution, and labeled RH-6201 preparations were aerated for 23 hours per cycle. After each cycle aeration was halted to allow the settling, and 1,400 ml of supernatant were then removed and replaced with fresh nutrient solution and increasing amounts of test compounds. Prior to discontinuing aeration, suspension samples were taken for plate counts, suspended solids, and to obtain solids and supernatant samples for radiocarbon analysis.

Samples of the suspension taken during aeration were serially diluted, and aliquots of these dilutions were plated on various growth media to determine the number of organisms (bacteria, actinomycetes, and yeasts) per ml of sludge suspension. Sludge solids from the filtration of 100 ml suspensions from each cycle were combusted, and the filtrates and trapping solutions (for volatiles and carbon dioxide) counted for carbon-14 activity by liquid scintillation spectrometry. Filtrates from cycle 10 were acidified, and partitioned by thin layer chromatography (TLC), along with preparations of RH-6201 as standards. Radioactive spots on the developed plates were located by radioautography, and the spots isolated and quantitated by liquid scintillation spectrometry.

RESULTS:

1. Effects on Microbial Population

Total plate counts on nutrient agar showed no variation between treated and control flasks, and there was also no variation in actinomycetes counts (on Bacto Actinomycetes Isolation Agar). An increase in yeast (plated on Bacto YM Agar) in treated flasks was attributed to acid conditions on cycle 8 of the treated flasks. Little variation in plate counts was observed in cycle 18-20, when addition of the test compounds was halted.

2. Carbon-14 Distribution

The study showed that more than 90% of the added labeled RH-6201 remained

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in the supernatant and was not adsorbed to the solids. This was true for both carbon-14 preparations of the compound. According to the authors, an increase in carbon-14 activity in the solids in cycle 8, when the pH was low, was apparently due to adsorption of the test compound to the solids under acidic conditions. Flasks containing the carbon-14 labeled parent compounds showed little or no evolution of carbon-14 volatiles. Evolution of labeled carbon dioxide from flasks containing the trifluoromethyl-labeled compound was approximately 0.5%, and was lower from flasks containing the carbon-14 label in the nitrophenyl ring.

3. Product Identification

Extracts of the supernatants were cochromatographed on TLC plates with preparations of the parent compound. The only compound found in the supernatant was RH-6201.

~~DISCUSSION.~~

- ~~1. See Conclusions.~~

3.19

CHEMICAL: Experimental RH-2512 (similar to Blazer)

FORMULATION: Carbon-14 labeled material

CITATION: Spillner, C.J. (1974). The Photodegradation of RH-2512 on Silica Gel Thin Layer Chromatography Plates (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 3923-74-42), Acc. No. 097720, Tab 7, p. 38

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: M.J. Edwards, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 9, 1979

TEST TYPE: Photodegradation: Silica Gel

MATERIALS AND METHODS:

Studies were conducted with one preparation of RH-2512 labeled with carbon-14 in the nitrophenyl ring and another preparation labeled in the trifluoromethyl group. These studies were conducted after previous studies showed RH-2512 as a photoproduct of RH-6201. Direct photolysis of the compounds under UV light on silica gel TLC plates was conducted for up to 16 hours, in the presence and absence of anthraquinone sensitizer. Exposed plates were spotted with reference compounds, developed in appropriate solvents and analyzed by radiochemical methods. Quantitation of the plates was conducted by scraping the radioactive areas of the silica gel, and counting by liquid scintillation spectrometry.

RESULTS:

Half-lives of approximately 8 and 16 hours for direct and triplet-sensitized photolysis of RH-2512, respectively, were found. The data indicated the formation of at least 10 photoproducts, four of which were identified:

Photoproduct 4 = 2-chloro-4-trifluoromethylphenol

Photoproduct 8 = 4-nitrophenol

Photoproduct 2 = RH-2512

Photoproduct 9 = 2-chloro-4-trifluoromethyl-4'-acetamido-diphenyl ether (tentative)

The presence of photoproducts 4 and 8 provides evidence for cleavage of the ether linkage.

NOTE

Data on ~~data~~ degradation products of the active ingredient are not required normally by the EFB. This data was reviewed under 6a2.

3.20

CHEMICAL: Blazer, sodium salt of acifluorfen, carbofluorfen (formerly RH-36201, RH-6201)

FORMULATION: Augenstein, L. L. (1976). Metabolism of ¹⁴C-RH-6201 in Rats, Soybeans and Soil (unpublished report by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 34H-76-17), Acc. No. 095733, Tab 14, p. 1009

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: Wan-Shya Chou, Staff Scientist, Enviro Control, Inc., Rockville, MD

DATE OF REVIEW: September 22, 1979

TEST TYPE: Field Dissipation Study

MATERIALS AND METHODS:

RH-6201 labeled with carbon-14 at the trifluoromethyl carbon was fed to two rats of opposite sex at approximately 700 ppm for 7 days. Samples of urine and feces were collected on days 3 and 7 of dosing for Carbon-14 content and metabolite identification.

Soil samples were taken from a labeled RH-6201 residue decline study for metabolite identification. RH-6201, labeled at either the trifluoromethyl carbon or carboxyl carbon, was applied to separate soybean plots, both preemergence and postemergence. The 0 - 2 inch layer of soil was sampled at 28, 57, and 112 days after treatment and extracted with methanol. Aliquots of the extract were assayed for carbon-14 and then concentrated for TLC and radioautography. The methanol-extracted soil was then extracted with NaOH and the supernatant of the mixture was fractionated into fulvic acid and humic acid fractions by using HCl. The fulvic acid fraction was extracted with ethyl ether and the extract was concentrated for TLC examination. The activities of the nonextractable and humic acid fractions were determined by combustion and radioassay.

Note: Since this soil data is submitted as part of a study required by other branches in HED, the data is assumed to not have been developed to satisfy EFB data requirements. The soil data was, therefore, not given a full registration review but was reviewed briefly for purposes of comparing the results with the results of data required and reviewed by EFB.

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RESULTS:

1. Metabolites of ^{14}C -RH-6201 Identified in Rat Extrema
(% of ^{14}C Recovered from TLC Plate)

Compound Identified	Feces				Urine			
	Day 3		Day 7		Day 3		Day 7	
	M	F	M	F	M	F	M	F
RH-5781	6	36	4	26	95	91	74	63
RH-4514	53	41	46	27	ND*	3	16	31
RH-4515	12	4	16	10	ND	ND	ND	ND

ND* - Not detected.

2. Metabolites of ^{14}C -RH-6201 Identified in Soil
(% of ^{14}C Recovered from TLC Plate)

TSI ^a (Days):	28	57	112	28	57	112	57 ^e
Site of ^{14}C Label:	CF ₃	CF ₃	CF ₃	COO ⁻	COO ⁻	COO ⁻	COO ⁻
Compound Identified ^b							
RH-5781	84	81	45	81	98	35 ^d	74
RH-4515 ^c	10	5	ND*	ND	ND	ND	ND
Retained at origin	3	3	21	9	ND	28	11
Unknown	3	10	33	2	2	37	15

^a TSI = Treatment to Sampling Interval^b Identification Based Only on TLC R_f Values^c Tentative^d May be Low Due to Work Up Difficulties^e Post emergence Treatment

ND* Not Detected

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3.21

CHEMICAL:

Blazer, sodium salt of acifluorfen, carbofluorfen
(formerly RH-36201, RH-6201)

FORMULATION:

Technical

CITATION:

Augenstein, L.L. (1976). A Summary of RH-6201
Residue Data for Soybeans and Soil (unpublished
report prepared by Rohm and Haas Co., Philadelphia,
PA, Technical Report No. 34H-76-22), Acc. No. 095734,
Tab 6, p. 327

TRADE SECRET CLAIM:

Yes

REASON FOR REVIEW:

Registration Standard

REVIEWED BY:

David F. Arieti, Staff Scientist, Enviro Control, Inc.
Rockville, MD

DATE OF REVIEW:

October 2, 1979

TEST TYPE:

Residue Study: Soybean

MATERIALS AND METHODS:

Nine soybean cultivars grown on silt loam, clay, and clay loam at 11
locations in the United States were treated pereemergence with various
doses of RH-6201.

RESULTS:

1. Average determinations after treatment at 1.0 to 4.0 lb ai/A ranged from
0.01 to 0.24 ppm.

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2. TREATMENT AND RESIDUE SUMMARY FOR SOIL (1 APPLICATION)

STATE	LOCATION	DOSAGE LB PER ACRE	SOIL TYPE	TSI (DAYS)	SOIL DEPTH (INCHES)	AVE. PPM	NO. SAMPLES
IL	BELLEVILLE	.000 1.000	SILTY LOAM	111	0-3 0-3	0.0 0.060	1 1
LA	TALLULAH	.000 .500	CLAY	105	0-3 0-3	0.0 0.240	1 1
PA	NEWTOWN	.000 2.000 4.000	SILT LOAM	139 139	0-4 0-4 0-4	0.0 0.025 0.086	3 6 7
PA	NEWTOWN	.000 1.000 2.000	SILT LOAM	138 138	0-4 0-4 0-4	0.0 0.010 0.037	1 3 3
TX	LUBBOCK	.000 1.000	SANDY CL LOAM	97	0.3 0.3	0.0 0.080	1 2

Note: Since this soil data is submitted as part of a study, required by other branches in HED, the data is assumed to not have been developed to satisfy EFB data requirements. The soil data, therefore, was not given a full registration review but was reviewed briefly for purposes of comparing the results with the results of the data required and reviewed by EFB.

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3.22

CHEMICAL: Blazer, sodium salt of acifluorofen, carbofluorofen (formerly RH-36201, RH-6201)

FORMULATION: Carbon-14 labeled material

CITATION: Satterthwaite, S.T. (1976). Translocation Studies with ¹⁴C-RH-6201 on Soybeans, Rice, Cocklebur and Nutsedge (unpublished report prepared by Rohm and Haas Co., Philadelphia, PA, Technical Report No. 3423-76-6), Acc. No. 095734, p. 294

TRADE SECRET CLAIM: Yes

REASON FOR REVIEW: Registration Standard

REVIEWED BY: David Arieti, Staff Scientist, Enviro Control, Inc. Rockville, MD

DATE OF REVIEW: October 3, 1979

TEST TYPE: Translocation in Rice, Soybean, Cocklebur and Nutsedge

MATERIALS AND METHODS:

RH-6201 labeled at the trifluoromethyl or carboxyl groups with carbon-14 was applied preemergence and postemergence to soybeans at the equivalent rate of 1 lb ai/A. A special marl clay loam soil was used, and a 15-hour day length was maintained with overhead lights.

On days 0, 14 and 28 after application, plant samples were taken frozen and shipped to a laboratory where they were prepared for radioautography and radioassay.

Soybeans, rice, cocklebur and nutsedge were used in the greenhouse study. Labeled RH-6201 was applied as a soil drench at the rate of 1 lb ai/A. The plants were sampled at 5 and 14 days after treatment.

RESULTS:

1. Uptake and translocation were noted in all samples.

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4. CONCLUSIONS

4.1 Environmental fate profile

Under the hydrolytic conditions found in the environment, Blazer (the sodium salt of the free acid RH-5781) will form the free acid which is stable in water. However, Blazer in an aqueous solution exposed to sunlight, will photodegrade with a halflife of about 2 weeks, releasing carbon dioxide and forming minor amounts (less than 7% each) of 8 photoproducts. Blazer will also photodegrade on soil with halflife of 57 days (continuous exposure), forming polar materials, unidentified compounds and about 10% of the volatile photoproduct RH-34800.

In soil, under aerobic conditions, Blazer will degrade with a halflife of 1-6 months forming the following metabolites in amounts not exceeding 10% of the initial application: RH-4514, RH-4515, RH-670, RH-883, AM-669-1 and an unidentified metabolite. Under sterile soil conditions, Blazer is stable, implying that degradation in non-sterile samples can be attributed to microbial metabolism. Under anaerobic soil conditions, Blazer will degrade with a halflife of about one week. RH-4515 is the major anaerobic soil metabolite reaching about 42% of initial application levels after 2 months of incubation and it is relatively stable under anaerobic conditions. Four unidentified compounds (each less than 11%) and unidentified polar material (30-47%) also form. Blazer, applied at label rates, will not affect typical soil microbes.

Blazer will dissipate under field conditions with a halflife of 4-7 weeks. It leaches readily in soil, but soil aged residues of Blazer do not leach. Soil adsorption/desorption data show Blazer to partition equally between soil and water at use rates. This information, however, is not considered to conflict with the leaching data because the adsorption/desorption study was run on a soil containing 40-800% more organic matter than the soils used in the leaching study and adsorption increases with increasing amounts of organic matter.

At use rates, rotational crops planted 3 months after treatment will not pick up residues exceeding 0.08 ppm as ^{14}C residues. An exception is carrot tops which would pick up as much as 0.1 ppm as ^{14}C when planted 4 months after treatment and harvested as 7 weeks. These residues would decline to 0.03 ppm when harvested at 15 weeks. Another exception is kale which could pick up as much as 0.2 ppm residues as ^{14}C when planted 2 months after treatment and harvested at maturity. Immature kale would have a ^{14}C residue content half as high but if the kale would be overwintered, residues would not exceed 0.03 ppm. Winter wheat is another exception. Residues in the mature grain would reach 0.04 ppm as ^{14}C when planted 3 months after treatment, but could be as high

as 0.15 ppm in other aerial parts of the plant. If other branches in HED consider these levels too high, necessitating other rotational intervals, more environmental fate may be needed.

Bluegill bioaccumulation factors are not expected to exceed 7X in whole body tissues and these residues will decrease by 85% during 2 weeks of depuration. Data from a study using parasitized catfish are not acceptable; however, the stability of Blazer in water, the soil half-life of 1-6 months and the low bluegill bioaccumulation factors, allows the conclusion that whole catfish bioaccumulation factors above 30X are not expected. The need for a catfish bioaccumulation study is deferred to EEB.

4.2 6a2 data

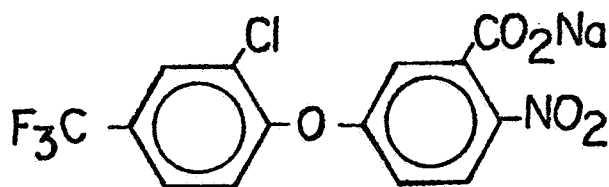
4.2.1 A photolysis study run using RH-2512 on silica gel TLC plates under UV light with and without anthraquinone sensitizer showed respective half-lives of 8 and 16 hours. At least 10 photoproducts were formed, 4 of which were identified. See the study in section 3.19 above for their identity.

4.2.2 An activated sludge study using activated sludge from an industrial waste treatment plant showed more than 90% of the added Blazer to remain in the supernatant. The Blazer is unchanged by the treatment process, does not affect the organisms in the sludge and would pass through the system in the effluent.

Note that an activated sludge study is not required for the proposed soybean use but the study was reviewed for 6a2 purposes only. However, should a future use of Blazer be proposed that does require an activated sludge study, then this data will have to be resubmitted or referenced and then reviewed for registration purposes.

4.3 All of the data requirements for the proposed use have been satisfactorily met.

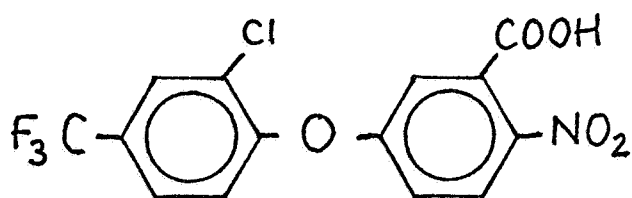
4.4 Parent, degradation products and where they occur



Parent Compound

Blazer, RH-6201

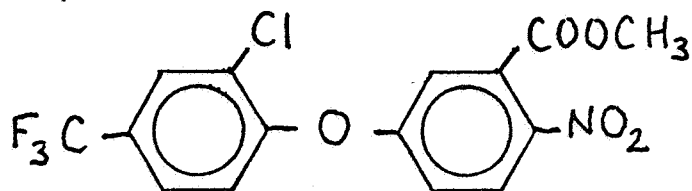
Sodium 5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoate



water, soil, rat
feces and urine

RH-5781

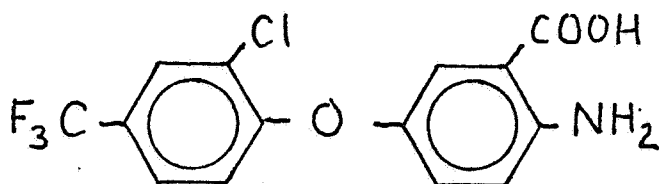
5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoic acid



soil, photo ^{degradation} on
soil (minor)

RH-5782

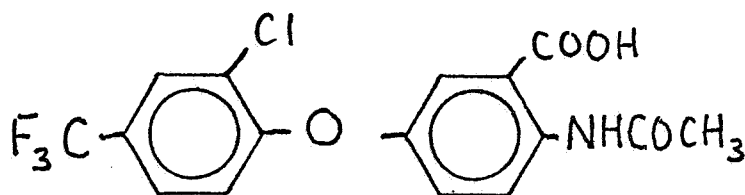
5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitro-methylbenzoate



soil, rat feces
and urine

RH-4514

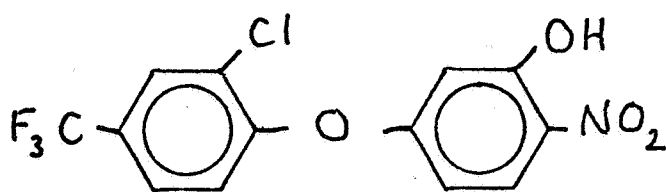
5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-aminobenzoic acid



soil, rat feces
photo on soil (minor)
^{degr.}

RH-4515

4-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-carboxylicacetanilide



soil

RH-670

5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrophenol

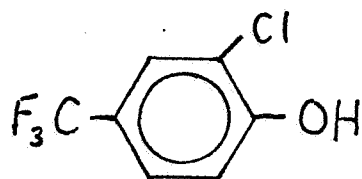
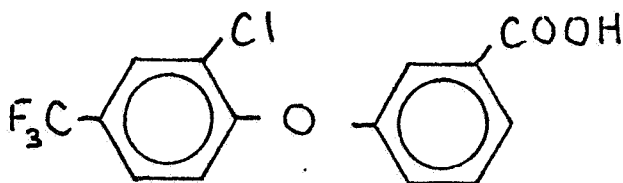


photo on soil
photo on silica gel

RH-34800

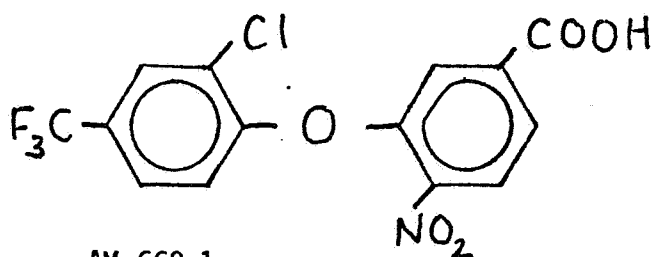
2-chloro-4-(trifluoromethyl)phenol



soil (minor - see
soil leaching data)

RH-883

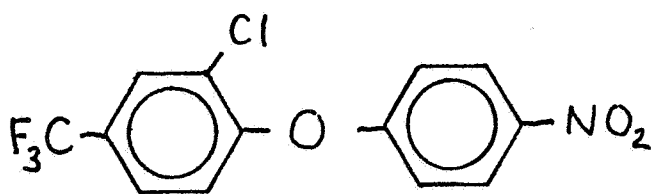
3-[2-chloro-4-(trifluoromethyl)-phenoxy]benzoic acid



soil (minor - see
soil leaching data)

AM-669-1

3-[2-chloro-4-(trifluoromethyl)-phenoxy]-4-nitrobenzoic acid



^{def}
photo in water

RH-2512

4-[2-chloro-4-(trifluoromethyl)-phenoxy]nitrobenzene

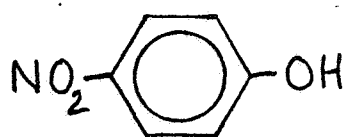
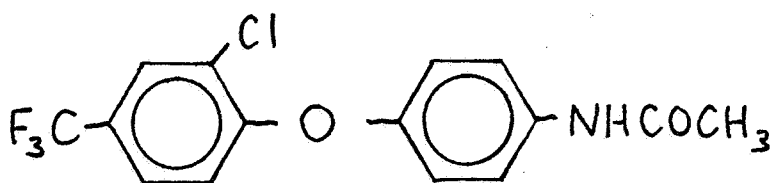


photo on silica gel

4-nitrophenol



^{def}
photo on silica gel
(tentative)

2-chloro-4-trifluoromethyl-4'-acetamido diphenylether

soil ^{def}
photo in water

CO₂

carbon dioxide

5. RECOMMENDATIONS

5.1 The data requirements for the proposed use of Blazer on soybeans have been satisfactorily met and the environmental fate of Blazer is known from the data.

5.2 Blazer leaches strongly in soil. Contamination of groundwater is a possibility. However, based upon the aged soil leaching study and field dissipation data, it is unlikely that aged residues of Blazer will leach in the field environment. To confirm that soil residues of Blazer do not leach to a significant depth, field monitoring data demonstrating that acifluorfen does not leach is required. Such monitoring may be obtained under conditional registration. The applicant must provide an acceptable protocol for monitoring the movement of acifluorfen and/or its degradates in soil and groundwater.

The monitoring protocol should address the following points:

The monitoring study should include various soils or soil types and ranges of organic matter content, to determine the movement of acifluorfen and its residues in a variety of soils, under use conditions. Sampling should be extensive enough to define the time course of movement through soil and into groundwater. Soil characteristics and soil hydrological characteristics should be reported. Rainfall, local water table, and water recharge information should be supplied. In addition, it is suggested that the applicant may be able to predict the movement of acifluorfen and its residues through soil and groundwater by experimental or mathematical techniques.

5.3 If the rotational crop residues and intervals raise concern in other branches in HED, then additional environmental fate data may be needed. EFB defers to TB/HED in this regard. See section 4.1, paragraph 4.

5.4 The need for a catfish bioaccumulation study is deferred to EEB. See section 4.1, paragraph 5.

5.5 Since an activated sludge study is not required for the proposed soybean use, the study was reviewed for 6a2 purposes only. Should a use of Blazer be proposed where an activated sludge study is required, then the study will have to be resubmitted or referenced and subjected to a registration review by EFB.

5.6 Other uses of Blazer may require additional environmental fate data.

RW Cook 12/28/79
Samuel M. Creeger Dec 28, 1979

Samuel M. Creeger
November 28, 1979
Section 1
Environmental Fate Branch
Hazard Evaluation Division

jcp:12/11/79